Tentative lecture schedule—Fall 2022, Insect Ecology (IB444)) *(labs*) (CRITIQUES due 2 weeks after unit ends)

August	22	Introduction		
	24	Nodal points in insect evolution		*8/25 Organization*
	26	Autecology:	physiology of small size	
	29		macro vs microclimate	AUTECOLOGY due Sept.6
September	31	Ecosystem:	overview	*9/1 Community Lab*
	2		herbivores	
	5	Labor Day		
	7		carnivores, detritivores	*9/8 Autecology Lab* ECOSYS due 9/21
	9	Population ecology	life history	
	12		diapause	
	14		dispersal	*9/15 Evolution Lab*
	16		dispersion	
	19		population modeling	
	21		competition I	*9/22 Ecosystem Lab*
	23		competition II	
	26		Optional review session)/Rosh Hashanah	
	28		predation (basics)	*9/29 Population Lab*
	30		predation (syndrome)	**Hour exam 10 am 9/30-9 am 10/3**
October	3		parasites	
	5		Parasitoids/Yom Kippur	*10/6 Community samples*
	7		parasitoids	POP ECOL due Oct 21
	10	Evolutionary ecology:	natural variation	
	12		speciation	*10/13 Human Ecol Lab*
	14		coevolution	
	17		plant responses to insects	
	19		insect responses to plants	*10/20 Statistics discussion*
	21		insecticide resistance	
	24		Catching up/strong inference	
	26		pollination	*10/27 Analyses, writeups*
	28		mimicry	
	31		plant-insect mutualism	
November	2		sociality	*11/3 Analyses, writeups*
	4		sex and mating systems	EVOL ECOL due Nov 18
	7	Community ecology	global patterns	
	9		historical processes	*11/10 Presentations*
	11		succession	
	14	**Hour exam**	**4 hours between 10 am 11/11 and 10 am 10/16**	
	16		island biogeography	*11/17 Presentations*
	18	Human ecology	agroecosystems	COMM ECOL due Dec 2
	19-27	Thanksgiving		
	28		biocontrol (classical)	
	30		biocontrol (nonclassical)	*12/1 Presentations*
	2		biocontrol (weeds)	
	5		insects in human environments	
	7		deliberate associations	HUMAN ECOL due Dec 12
	9	Reading day		
Final exam		(take-home)	Due 11 am December 12	

*Critiques are due two Fridays after the last lecture in the unit; when data collection is complete, due dates for laboratory experiments will be announced (two weeks after

IB444 Insect Ecology Fall 2022
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Office: 4072 Natural History Building (by arrangement)
Schedule: Lectures: MWF 9:00-9:50 am 2083 Natural History Building
Laboratory is scheduled Thursdays from either 2-3:20 or 3:30-4:50, either 4072 NHB or outdoors (ideally on campus, at locations reachable on foot, by bicycle, or public transportation as much as possible).
Credit hours: 3 or 4 hours—lecture only, 3 hours; with laboratory, 4 hours.
Prerequisite: Any two-semester sequence in basic biology or consent of instructor.
Webpage: 2022 materials available on Moodle

Course description

Insect Ecology is a discussion of the conceptual and practical aspects of ecology in relation to insects as individuals, as members of populations, as species in communities and as providers of ecosystem services. Emphasis is on the attributes of insects that differentiate their ecology from the ecology of other, mostly larger, animals and thus includes their spectacular diversification and rapid evolution, their capacity for adapting to an extraordinary variety of challenging environments, and their multifarious interactions with other organisms, including humans.

Recommended text: None

Specific learning objectives are to acquire:

-- an understanding of the ecological constraints and enabling features associated with the basic insect Bauplan
--an appreciation of both the economic costs and the economic benefits associated with ecological interactions between insects and humans
--an ability to analyze, evaluate, and interpret the ecological literature as it relates to insects
-- sufficient familiarity with that literature in order to place novel findings into an appropriate context
--mastery of ecological terminology and concepts to provide cogent and comprehensive answers to questions relating to insect ecology

COURSE POLICIES

Academic integrity: This course will follow all policies in the *Student Code* as it relates to academic integrity. As stated in the Student Code (1-401, p. 17), "It is the responsibility of each student to refrain from infractions of academic integrity, from conduct that may lead to suspicion of such infractions, and from conduct that aids others in such infractions. Regardless of whether a student has actually read this…, a student is charged with knowledge of it. Ignorance is not a defense". The entire code is here: http://studentcode.illinois.edu/ .
Note that ignorance of the code is not a defense, so you should become familiar with all of the policies and standards associated with the code. If you are found violating the policies in any way, you will be referred to the Committee for Student Academic Integrity; if this body finds you guilty, you will fail the course and be referred to the Dean of your college. Here, by the way, is the campus integrity statement:
The University of Illinois at Urbana-Champaign expects its faculty, staff, students and guests to conduct themselves in accordance with the community values of civility, respect, and honesty; to maintain the highest level of integrity and exercise critical judgment in all dealings, decisions and encounters; and to maintain and strengthen the public's trust and confidence in our institution.

Attendance: Because there is no textbook for this class, attending all lectures is the optimal way to learn the material; if you know you'll miss a lecture, letting the instructor or TA know ahead of time will be much

appreciated. If you do miss a class, you're still responsible for the material covered and you will still have to make up the work missed. A makeup exam will be offered to accommodate any student with a legitimate reason for missing an exam during its scheduled time period but arrangements for the makeup exam must be made with the instructor; students who miss a laboratory period must arrange to make up the missed work with a teaching assistant.

Disability accommodations: If you need disability accommodations or adjustments, please just contact me and the Disability Resources and Educational Services (DRES) at your earliest opportunity so that you can get the assistance you need. To contact DRES, you can go in person to 1207 S. Oak St., Champaign, call 333-4603 (V/TTY), or send an e-mail message to disability@illinois.edu

All requests to DRES for accommodation are kept in strict confidence.

Course requirements and grading

	% total grade	
I. Exams: first hour exam	20	
second hour exam	20	
third exam	20	Due 11 am Monday December 12
II. Library/laboratory exercise	15	5 per semester (of 6)
III. Project report	15	1 per semester Due December 7
IV. Discussion/participation	10	

NOTE:

§ Exams will be based on lecture material. All exams are take-home format (closed-note and no Internet); you'll be allowed to choose a four-hour period over the course of about four days to download, complete, and upload the exam. The exams are designed to test your ability to interpret studies that haven't been discussed during lectures and to relate the findings of those studies to material that was covered in class.

§ For students taking the course for 3 h (lecture only), there are five writing assignments, each of which is to select a recent article in the ecological subject area covered in lecture (five of six: autecology, ecosystem ecology, population ecology, evolutionary ecology community ecology, human ecology) and critique it as you would were it a manuscript submitted to a journal for publication. Articles should be selected from appropriate current journals (accessed through the UIUC Library portal or Google Scholar) but your article must be no more than two years old.

§ Students taking the course for 4 h (with lab) will write and submit reports for five of the six experiments undertaken during the lab sessions. In lab sections, students have the option of submitting six reports/reviews and dropping the one receiving the lowest score.

§ The project report is a short (5-15) page paper in which students pose a hypothesis and test the hypothesis. Students taking the course lecture-only can base their project on data that have already been published. Examples of such "armchair" studies utilize data already published in the peer-reviewed literature (e.g., systematic reviews or meta-analyses). Examples of such studies in ecology are abundant (see next page). These papers are to be written in standard scientific style, according to the format and specifications of a journal to which the paper could conceivably be submitted. All hypotheses must be approved by MB.

Each student taking the class for 4 h (with lab) is to devise a hypothesis and design and conduct an experiment to test the hypothesis and then write up the results in scientific style as if for publication. Field projects can also primarily descriptive (e.g., food web analysis in a particular microhabitat, determination of the membership of a specific guild), but hypothesis-testing should be an integral part even of these studies. All descriptive projects must include properly labeled and identified voucher material (specimens or photographs). Field projects are of course limited by seasonal vagaries; lab projects can involve a tremendous variety of techniques and species. All hypotheses for independent projects must be approved by MB.

Check with me or the teaching assistant before beginning your experiment about experimental design and availability of equipment and/or livestock.

By the way, here are some tips on choosing a journal for your project write-up:

https://www.editage.com/insights/how-to-choose-journals-for-submitting-your-paper

What to do in an emergency situation—run, hide, fight (quoted from https://police.illinois.edu/em/run-hide-fight/resources-for-instructors/#attachment

"Emergencies can happen anywhere and at any time, so it's important that we take a minute to prepare for a situation in which our safety could depend on our ability to react quickly. Take a moment to learn the different ways to leave this building. If there's ever a fire alarm or something like that, you'll know how to get out and you'll be able to help others get out. Next, figure out the best place to go in case of severe weather – we'll need to go to a low-level in the middle of the building, away from windows. And finally, if there's ever someone trying to hurt us, our best option is to run out of the building. If we cannot do that safely, we'll want to hide somewhere we can't be seen, and we'll have to lock or barricade the door if possible and be as quiet as we can. We will not leave that safe area until we get an Illini-Alert confirming that it's safe to do so. If we can't run or hide, we'll fight back with whatever we can get our hands on. If you want to better prepare yourself for any of these situations, visit police.illinois.edu/safe. Remember you can sign up for emergency text messages at emergency.illinois.edu."

IB 444 Lab Information and advice

Lab grades are based on completion of five laboratory reports, a semester project report and presentation, and participation.

Lab reports: There are six labs conducted over the course of the semester, five of which you need to write up in the format of a suitable journal as if for submission (exemplar lab reports from previous semesters are available on the course website). ALL lab students are expected to participate fully in each lab, regardless of whether they intend to write that lab up for credit or not. Data collection is done as a class, with results from the two sections often pooled for analysis. Failure of any single student to participate in the experiment and collect data will detrimentally affect the experimental results for all other students so please don't slack off unless you have a very good reason for doing so. Lab reports are aspirationally due one week after final data are collected for each lab. For example, the first lab, autoecology, will last for one lab period so the report could, if nothing goes wrong, could be due during the lab the following week. The population biology lab, on the other hand, is a life table and lasts as long as the organisms live, so the report is due the week after the last insect has died. As stated, there are six potential lab reports. You may write all six and have the lowest score dropped from your grade, or if you are happy with the first five reports you may skip writing up the sixth report. Lab reports should be emailed to the TA.

Project Report and Presentation:

A project can be a new idea arising *de novo* for this class or it can be an extension of current work that you are doing, as long as it is not the main focus of your research. It CANNOT be a project you completed last semester, one for a previous degree, current graduate work directly leading to your degree, or any other project you have already received credit for, or will receive credit for, by the end of this term. We have several insect species that the department raises throughout the year that you can use for more laboratory-based projects, or you can conduct an entirely field-based project; it's very open. One thing to keep in mind is that this is an INSECT ECOLOGY project. If your idea has nothing to do with insects or ecology, you are not going to receive credit. Starting your project sooner rather than later is highly recommended, as the rapidly approaching cold weather is going to limit your outdoor options severely.

Each lab student will prepare a PowerPoint presentation of his or her project for a ten-minute talk given during the last three weeks of lab. A laptop and projector will be available. The project report is due the last day of class. Final project reports should be emailed to mayberenbaum@gmail.com and labeled IB44418Lab#[LastnameFirstInitial].

By the way, a potentially useful text might be R Karban and M Huntzinger 2006, How To Do Ecology: A Concise Handbook. Princeton: Princeton University Press.

Students in the lecture-only section will test a hypothesis just as students in the lecture-lab sections but will extract literature from the peer-reviewed scientific literature to test their hypothesis (typically by carrying out a systematic review or meta-analysis. Here are examples of publications in which a hypothesis is tested using data from the literature:

Berenbaum M. 1980. Adaptive significance of midgut pH in larval Lepidoptera. Am Nat 115:138- 146.

Cole, B.J., 1980. Growth ratios in holometabolous and hemimetabolous insects. Ann. Ent. Soc. Amer. 73:489-491.

Cornell H.W. and J.O. Washburn, 1979. Evolution of the richness-area correlation for cynapid gall wasps on oak trees: a comparison of two geographic areas. Evolution 33:257-274.

Ehler L. and R. Hall, 1982. Evidence for competitive exclusion of introduced natural enemies in biological control. Environ. Ent. 11:1-4.

Koricheva J, D Hayes, 2018. The relative importance of plant intraspecific diversity in structuring arthropod communities: a meta-analysis. Functional Ecology 32:1704–1717

Main AR, EB Webb KW Goyne, D Mengel, 2018. Neonicotinoid insecticides negatively affect performance measures of non-targat terrestrial arthropods: a meta-analysis. Ecol Appl. 28: 1232-1244.

Mallinger RE, Gaines-Day HR, Gratton C, 2017. Do managed bees have negative effects on wild bees?: A systematic review of the literature. PLoS ONE 12: e0189268.

Niemelä, P. , S. Hanhimä and R. Mannila, 1981. The relationship of adult size in noctuid moths (Lepidoptera, Noctuidae) to breadth of diet and growth form of host plants. Ann. Ent. Fenn. 47:17-20.

Parker J.D., D.E. Burkepile, and M.E. Hay 2006. Opposing effects of native and exotic herbivores on plant invasions. Science 311: 1459-1461.
Scriber, J.M. 1973. Latitudinal gradients in larval feeding specialization of the world Papilionidae. Psyche 80:355-373.
Steinly BA 1986. Violent wave action and the exclusion of Ephydridae (Diptera) from marine temperate intertidal and freshwater beach habitats. Proc Ent Soc Wash. 88: 427-437.
Wasserman S. and C. Mitter, 1978. The relationship of body size to breadth of diet in some Lepidoptera. Ecol. Entomol. 3:158-160.
Wiegmann, B.M., C. Mitter, and B. Farrell, 1993. Diversification of carnivorous parasitic insects:
extraordinary radiation or specialized dead end? Am. Nat. 142: 737-754.
Vidal MC, SM Murphy, 2018. Bottom-up vs top-down effects on terrestrial insect herbivores: a meta-analysis. Ecology Letters 21: 138-150.
Wojcik VA, LA Morandin, LD Adams, KE Rourke, 2018. Floral resource competition between honey bees and wild bees: is there clear evidence and can we guide management and conservation. Environ. Entomol. 47: 822-833.

Library Exercises

For each subject area in insect ecology, every student in the lecture-only section should hand in a one-page review of a journal article from the current literature. The article selected is entirely up to each student as long as it's in a journal indexed in Web of Science. The only other requirements are that the article describe original research (no review articles!) and the article must be less than two years old.

In the review, provide the full bibliographic citation (author, date, title, journal, volume, page #s) and URL if possible. There should be:

1. a brief summary of the results and conclusions of the study
2. a critique of the experimental techniques and statistical analyses used (and an evaluation as to whether the data justify the conclusions)
3. a statement of the overall significance and originality of the research

In brief, you are being asked to review a published article. This exercise is designed to accomplish several ends. First, it introduces you to the many journals in which insect ecology is published; second, it increases the probability of regular Internet searches for current literature; and, third, it will accustom you to reading articles with a critical eye. Peer review is an essential part of the publication practice; those who intend to pursue any science professionally should be prepared to participate. Even for people with no professional interest whatever in insects, ecology, or any other kind of science, reading research findings critically can be important in daily life (e.g., does aspartame increase the risk of Alzheimer's?).

Selective list of journals publishing studies in insect ecology:
American Midland Naturalist, American Naturalist, Animal Behavior, Arthropod-Plant Interactions, Behavioral Ecology and Sociobiology, Biotropica, Canadian Entomologist, Chemoecology, Ecological Entomology, Ecology. Ecological Monographs. Entomologia Experimentalis et Applicata, Environmental Entomology, Evolution, Evolutionary Ecology, Florida Entomologist, Functional Ecology, Great Lakes Entomologist, Insects, J. Anim. Ecol., J. Chem. Ecol., J. Econ. Entomol., J. Insect Conservation, J. Insect Science. J. Kansas Ent. Soc., J. Medical Entomology, J. Pollination Ecology, Nature, Nature Ecology & Evolution, Oecologia, Oikos, PLoS ONE, Proc. Ent. Soc. Wash., Proceedings of the National Academy of Sciences, Science, Science Advances