

INSECT ECOLOGY - ENTO 424

Spring 2013

SYLLABUS

INSTRUCTOR: Robert N. Coulson
Professor

OFFICE LOCATION: HPCT 408

PHONE: 845-9725

E-MAIL r-coulson@tamu.edu

OFFICE HOURS: After lecture and by appointment

LECTURE ROOM: HPCT 102

TIME: Lecture Monday - Wednesday (10:20-11:10P) Room 102 HPCT;
Lab Tuesday (12:45P –3:35P and 3:50– 6:45) Room 205 HPCT

COURSE DESCRIPTION: Insect ecology is presented as a study of the influences and interactions of insect populations and insect communities on ecosystem processes that affect landscape structure, function, and change. The level of focus is the ecosystem, the levels of explanation include populations and communities, and the level of interpretation is the landscape.

COURSE GOAL: To provide a synthesis of ecological principles with an applied interpretation.

EXPECTED LEARNING OUTCOME: (1) A broad-based knowledge of the principles of ecology at four levels of integration [populations, communities, ecosystems, and landscapes], (2) an understanding of the linkages between the levels of integration, (3) an understanding of the relationship between principles of insect ecology and the scientific and applied charges of entomology, (4) a functional vocabulary of ecological terms and concepts, and (5) a fundamental background in ecology adequate for more advanced study of basic and applied principles of ecology.

TEXTS: The information base for ENTO 424 has been organized into the following subject areas: (i) Introduction to Insect Ecology, (ii) Principles relating to populations, (iii) Principles relating to communities, (iv) Principles relating to ecosystems, and (v) Principles relating to landscapes. In addition, a glossary of pertinent ecological terms has been compiled. The note set and laboratory manual are provided to students as a CD at no cost. Class lectures are also posted on the INTERNET and students will be provided password access. A single text to cover the topics outlined in the syllabus is not available. Text materials have been taken from several sources. Schowalter (*Insect Ecology*), Speight et al. (*Ecology of Insects*), and Price et al. (2011) (*Insect Ecology*) are recommended as a reference text.

Schowalter, T. D. 2006. *Insect Ecology* 2nd Ed. Academic Press. NY.

Speight, M. R., M. D. Hunter, and A. D. Watt. 2008. *Ecology of Insects*. Wiley-Blackwell, Oxford.

Price, P. W. R. F. Denno. M. D. Eubanks, D. L. Finke, and I. Kaplin 2011. *Insect Ecology*. Cambridge University Press.

GRADING: Grades will be based on performances on the following examinations and assignments:

1. Three hourly exams covering (i) populations, (ii) communities & ecosystems, (iii) landscapes [100 points each] [Weight =50%]
2. Laboratory Reports [100 points each]¹ [Weight = 35%]
3. Final examination [100 points] [Weight 15%]

The exam format will be objective. Students are expected to take exams on the day scheduled. Student grades are based on A ←90, B ←80, C ←70, D ←60 percentages².

The laboratory will be graded using the rubric provided in the laboratory manual. Students will be grouped in teams and all are expected to participate equally in the conduct of the laboratory exercise. Each student is responsible for preparing their own laboratory report (based on the data resulting from their group's laboratory exercise). Students may leave laboratory early only if the report is completed and submitted. Laboratory reports are due at 12:00 noon on Friday. The grade will be based on the individual student laboratory report.

¹ Instructions for preparation of reports will be provided at the first laboratory session.

² A Student absent 25% of classes will be removed from the roster.

NOTICE TO STUDENTS REGARDING PLAGIARISM (Statement from the Texas A&M University Faculty Senate - January 9, 1997): “As commonly defined, plagiarism consists of passing off as one's own the ideas, words, writings, etc., which belong to another. In accordance with this definition, **YOU ARE COMMITTING PLAGIARISM IF YOU COPY THE WORK OF ANOTHER PERSON AND TURN IT IN AS YOUR OWN, EVEN IF YOU SHOULD HAVE THE PERMISSION OF THAT PERSON.**”

NOTICE TO STUDENTS REGARDING THE AMERICANS AND DISABILITIES ACT: The American Disabilities Act (ADA) is federal antidiscrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student, Life, Services for Students with Disabilities in Cain Hall, Rm. B118, or call 845-1637.

NOTICE TO STUDENTS REGARDING THE AGGIE HONOR CODE: “An aggie does not lie, cheat, or steal, or tolerate those who do.”

CLASS ETIQUETTE: Students are expected to be in their seats and prepared for lecture at the time scheduled for the start of class. Personal conversations should cease at this time.

- If a student must be late, please enter quietly and be seated as close to the door as possible.
- If you have reason to be late consistently, please discuss the reasons with the instructor and obtain approval.
- If a student is absent, the student remains responsible for all lecture or laboratory subjects discussed and materials provided during the period(s) of absence.
- No cell phones or pagers in use or active.

COURSE SCHEDULE:

Week 1: Introduction to Insect Ecology (Jan 14)

INTRODUCTION TO INSECT ECOLOGY:

Key Messages: Important questions (what is entomology and what is its purpose, what is ecology and what is its purpose, why study insect ecology [insect diversity, abundance and distribution, impact on ecosystems, integration of basic and applied biology]), insect ecology defined, levels of organization, relation to traditional view of insect ecology, conclusions.

Orientation (syllabus and source materials)

Overview of Ecology: What is Insect Ecology?

Begin Populations.

POPULATIONS (10 units)

Key Messages: Introduction (basic definition [population, population dynamics], population system overview (elements of the population system, properties of the environment, properties of the individuals, population processes [rates, natality, mortality, dispersal], population state variables[quantities], interactions of insects and their environment [linkage, concept of fitness, evolution and coevolution, feedback]); models of population growth; factors responsible for changes in the distribution and abundance of insects (concept of density dependence and density independence, concept of negative and positive feedback, adaptations of insects to their environment, life cycle/life history strategies[r & K strategists]); concept of unitary and modular organisms (demographic equation for insects and plants); population cycles and insect outbreaks; simulation of population dynamics; applications (IPM, using simulation models).

Overview of Ecology: What is Insect Ecology?

Population Dynamics: Overview of the population system concept

Laboratory: Introduction to EcoBeaker® Laboratory and Instruction for preparation of laboratory reports.

Week 2 (Jan 21):

Properties of the environment (conditions and resources)

Properties of individuals

Properties of individuals & properties of the environment, evolution and coevolution

Laboratory: EcoBeaker - Quadrant Sampling

Week 3 (Jan 28):

Population processes (natality, mortality, dispersal)

Population processes (natality, mortality, dispersal)

Population state variables

Laboratory: EcoBeaker - Logistic Growth

Week 4 (Feb 04):

Population state variables

Population age distribution, population growth

Population growth, r & K selection

Laboratory: EcoBeaker - Mark/Recapture

Week 5 (Feb 11):

Population Change (density dependent and density independent mortality)

Population dynamics of modular organisms

Application of information on population dynamics

Laboratory (an entertaining “bug” story)

Week 6 Begin Communities (Feb 18)

Quiz on Population Dynamics

COMMUNITIES (4 units)

Key Messages: Species interactions (concept of the niche, competition [interspecific, intraspecific, competitive exclusion, ghost of competition past], predation & parasitism [functional & numerical responses], herbivory [plant defense mechanisms], mutualism, commensalism, neutralism, protooperation), relative abundance (commonness and rarity of species), species diversity [species richness, species evenness, measures of diversity], trophic structure [food chains, food webs].

Overview of communities, species interactions (concept of niche)

Competition

Laboratory: EcoBeaker - Competitive Exclusion

Week 7 (Feb 25):

Predation, Parasitism

Herbivory, Mutualism

Trophic structure

Laboratory: EcoBeaker – BioControl

Week 8 (March 4):

Species abundance relationships, species diversity

Trophic structure

Laboratory: EcoBeaker - Keystone Predator

Week 9: (March 11) Spring Break):

Week 10 (March 18): Begin Ecosystems

ECOSYSTEMS (4 units)

Key Messages: Ecosystem structure (production, consumption, decomposition, abiotic storage), integrating variables (energy in ecosystems, nutrient cycling in ecosystems), utility of the ecosystem concept, roles of insects in ecosystems.

Introduction to ecosystem concept, Ecosystem structure

Ecosystem Structure

Laboratory: EcoBeaker - Environmental Gradient

Week 11 (March 25):

Energy in ecosystems

Nutrient cycling in ecosystems

Insects in ecosystems

Laboratory: (an entertaining “bug” story)

Week 12 (April 1): Begin Landscapes

Quiz on Communities and Ecosystems

LANDSCAPES (4 Units)

Key Messages: Introduction to landscape ecology, landscape structure (patches, corridors, matrix, network), concept of ecotope, landscape change (geomorphology, disturbances, plant & animal invasions), landscape function, landscape management, effects of insects in landscapes.

Landscape concept

Landscape structure

Laboratory: EcoBeaker -Predator Avoidance

Week 13 (April 8):

Landscape change

Landscape function

Laboratory: EcoBeaker - Corridors, Stepping Stones, and Butterflies

Week 14 (April 15):

Landscape management

Quiz on Landscapes

Week 15 (April 22):

Review