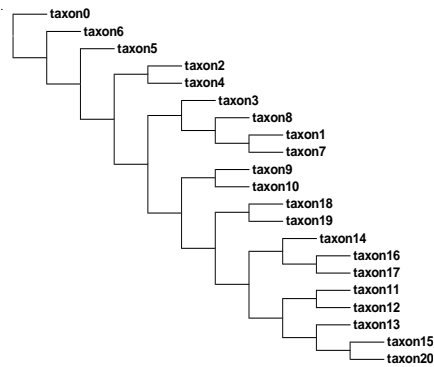


Insect Classification – ENY 4161, 6166  
 Fall 2009 Course Syllabus, Outline



*Cicindela highlandensis* Choate



### **Course Introduction**

Insect classification is often considered synonymous with insect identification. However, while identification is involved in classification, classification involves much more than placing a scientific name on a specimen. The goal of a classification system is to arrange taxa according to their degree of relatedness, determination of a phylogeny based on the results of multiple comparisons. Which comparisons are used to arrive at a classification system are usually determined by an expert.

This course will introduce you to the identification of many adult insects. It will also introduce you to some of the concepts and methodologies used to create a classification system.. You will become proficient at identification through the use of dichotomous keys. In addition to identification you will be introduced to many of the terms of the Codes of Zoological Nomenclature. As you will discover, literature is THE resource that allows you to work on a classification scheme. Proper citation of literature, researching literature, and combining information into a functional identification key are all exercises you will accomplish in this class.

### **Objectives and Goals**

This is a course dealing with insect classification. You will be introduced to a variety of topics related to classification. As a result you will be expected to understand the processes behind species descriptions and definitions; to locate relevant literature; to use a variety of techniques to determine species names of assigned insects, and to recognize many of the commonly encountered Florida insects. You will acquire expertise at identifying insects using a variety of resources including dichotomous keys; You will learn how to search the literature (online and traditional ways) for information about particular insects; Know the significance of and how to locate the description, author and date of publication for species; Graduate students will develop a regional identification key to species for families of one or more orders of insects; Understand the morphological approach to species definitions and challenges to species concept; Understand that classification involves much more than looking at a few dead insects mounted on pins; Develop the skills necessary to identify adult insects that you have never seen before and which do not necessarily occur in Florida.

#### **Course Goals:**

- Learn how to collect and curate adult insects (this should be a review for most of you)
- Learn how to locate and use relevant literature for insect identification
- Develop skills necessary to identify adult insects that you haven't seen before (other than looking at pictures)
- Learn how to create and use dichotomous keys to identify adult insects
- Learn principles of taxonomy, systematics
- Learn some of the rules of Zoological nomenclature

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- Recognize many families in most of the Orders of adult insects found in Florida
- Learn techniques for researching species information
- Develop an understanding of the complexity and application of the species concept
- Experience the creation and analysis of a classification system

**Required textbooks:**

Arthropod Collection and Identification – Laboratory and Field Techniques. . J. Gibb and C. Y. Oseto. 2006.

Introduction to the Study of Insects. 7<sup>th</sup> Edition. Triplehorn and Johnson. There have been several major changes in the higher classification of insects which are not reflected in earlier editions of this textbook. You will be expected to use the current nomenclature which is used in this book.

**Suggested reading:**

Grimaldi, D., and M. S. Engel. 2005. Evolution of the insects. Cambridge University Press. New York, New York. 755p.

**Course Prerequisites:**

**ENY 3005**, Principles of Entomology, or another course dealing with classification of insects and/or other arthropod taxa. It is desirable for students to already have a familiarity with the insect orders. If you have not had such a course it will be up to you to learn some of the basic concepts we will use here throughout the semester. Note: general Entomology review will be minimal as we have too many topics and too little time to learn material.

Each student must also have an **Active Gatorlink E-mail account** with reliable **Internet access**. In addition, hopefully each student will feel comfortable using a computer to write exercises and send email attachments.

**Instructor:** Dr. Paul M. Choate

Email: [oskar@ufl.edu](mailto:oskar@ufl.edu)

Office: Rm. 2004 Entomology and Nematology, Bldg 970 Natural Area Drive

Phone: 353-273-3914

FAX: 352-392-0190

**Office Hours:** By appointment. I spend a lot of time in the field and am not always available, so please check with me if you desire to meet.

**Class meeting:** room 3118: Tuesday (2-4)– (8:30AM – 11:30); Thursday (3-4) – (9:35AM-11:30)

**Please arrive on time! Class starts promptly. Turn off all cell phones prior to entering the classroom.**

**FINAL EXAM** (written)– **15C, Dec. 15, 12:30-2:30PM, rm. 3118**

**Outline of Course Topics Covered (not in any particular order)** - Each topic will usually have an exercise or exercises that will introduce you to concepts which you will apply to particular problems. Any exercise that is handed out during class will usually be due by the end of that class meeting, unless you are given other instructions. Late exercises are unacceptable!

- Overview of the processes involved in the recognition of a species, determining whether it is a new record, new species, introduced species or already known. This will introduce you to the entire process of species determination, and touched on all of the major topics we will cover this semester.
- [Collecting and curating insects](#) - collection techniques
- [Morphology](#) used in classification of adult insects - hopefully a review
- Taxonomy hierarchy in Insect classification: recognizing [Orders and families of adult insects](#)
- Creating and using identification keys
  - Uses and abuse of insect identification keys - picture ID vs. comprehensive keys
- Searching entomological literature, locating references, determining full citations and abbreviations
- Internet resources, local resources (library, museum)
- Classification techniques other than traditional morphological approach
- Zoological Classification - Need for, origin and history
  - Rules of Zoological Nomenclature, law of priority
- The species concept, inherent problems
  - Speciation processes, vicariance, dispersal
  - Distribution patterns, horizontal and vertical distribution
  - Zoogeography and classification
    - Precinctation - **Required reading:** Frank, J. H. and E. D. McCoy. 1995. Precinctive insect species in Florida. Florida Entomologist 78: 21-35.(online at Florida Entomologist web site)
  - Sympatry, allopatry, allochryony, synchrony
  - The holomorphological approach to species definition; multi-dimensional species concept
- Species descriptions
- Publication of scientific names
- Phylogeny, introduction to cladistics, techniques and terminology
  - Homology
  - Monophyly

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Fall 2009 – Class meetings Schedule –(topic order is subject to change based on class background, needs, and interests)

<b>Week -Dates</b>	<b>Tuesday 8:30AM-11:30AM</b>	<b>Thursday 9:35AM-11:30AM</b>	<b>References, resources, activities</b>
1	No class meeting	Introduction, protocol, background, collections, projects,	Handouts; diagnostic exercises
2	Issue collecting equipment; discussion of collections; why a collection? Collecting techniques and supplies	Morphology of adult insects; if you are not familiar with adult insect morphology, review!!!	Chapters 1 & 3 (Gibb & Oseto); collection labeling
3	Mini-collection due; Review insect Orders; curate specimens from collections	Diagnostics quiz; Writing and Using keys	Order key; Check mini -collections for proper curating
4	Researching an insect species - distribution, literature, diagnostics Defining a species. Glossary of terms	Purpose, Terms and Rules of Zoological nomenclature; glossary of Zoological Nomenclature terms	Morphology and nomenclature quiz xwords <b>Systematics and Zoological Nomenclature)</b>
5	Descriptions, diagnosis, diagnostic characters; describing species Original species description; Journal titles and abbreviations; proper citation; locating author's name and date of publication of species description	Insect distributions (including modern day vicariance); other factors related to determining identification; speciation processes	Research species names; examples of nomenclature problems; impact of modern day roadways on distribution patterns
6	Primitive" insect Orders, entognathy, view pages at: <a href="http://www.ento.csiro.au/EcoWatch/Hexapods.htm">http://www.ento.csiro.au/EcoWatch/Hexapods.htm</a> (Protura, Collembola, Diplura)	Begin Hemimetabolous insects; Dermaptera, Orthopteroid insects (Orthoptera, Blattodea, Mantodea, Phasmida)	(Textbook - Entognathous Hexapods);
7	Midterm ID exam	Midterm written exam	
8	Review exams; begin hemimetabolous insects	Hemiptera; (3 suborders),	
9	Other hemimetabolous insects;	Mini <b>Collection 2 due</b> , check for proper identification, labeling, curating. Neuroptera, begin Coleoptera	ID quiz on Orthopteroids, Hemipteroids
10	(Coleoptera cont.)	ID quiz	

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11	Begin Diptera ,	<b>Diptera</b>	
12	Hymenoptera; written exercise	misc Orders, Lepidoptera	
13	Cladistics – methodology; creating a data matrix	Work on collections <b>TBA</b>	
14	<b>Review all classification topics</b>	Thanksgiving – no class	
15	Collections	Final exam Review; all collections and graduate term papers due	
16	Last class meeting; evaluations		
	<b>FINAL EXAM</b> , rm 3118; 12:30 – 2:30PM		

TBA = To be announced

### Grading

This course will NOT be using the minus grading system. For more information about grading see the University web site at the following URL: <http://www.registrar.ufl.edu/catalog/policies/regulationgrades.html>

Your final grade will be determined by your performance on **all** in-class exercises, written exams, identification exams, projects, collections, written take-homes handouts, and any other graded work. The values for such work will be indicated on each item as they are returned. Some exercises will receive a numerical grade, others will receive a check indicating satisfactory completion. There will be several written and diagnostic exams. The number and need for these will be determined by the instructor. There will be a mid-term written and diagnostic exam, as well as final written and diagnostic exams. When you are asked to identify specimens you will be allowed to use reference materials as defined by your instructor for that particular exam. ***We do NOT encourage you to rely on sight-identification in this course.***

### Deadlines

There will be deadlines for you to meet for each exercise. Most exercises must be completed and turned in by the end of the same class ***unless you are told otherwise***. To receive credit for the exercise it must be completed **on time according to instructions**. ***If you fail to meet a deadline for an exercise, paper, collection, or exam, there will be significant grade reductions. Depending on the circumstances, each day late will result in a grade deduction before any scoring is undertaken.*** There may be some review exercises posted on a web site. Therefore, when advised by me, please take time to prepare before coming to class (you will be informed of these). This will minimize the amount of time spent talking, and provide for maximum "hands on" experience for you.

Your collection will occupy a large part of your time investment in this course. The due date for the collection will be two weeks prior to the last day of classes.

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This will not be negotiable. Students frequently underestimate the time required to curate their collection. Do not be one of those! You will be asked to bring in small samples of your collection to check on curation techniques, and to update your progress. While collection requirements will be detailed in a separate handout, be aware that failure to meet the deadline and collection requirements will result in a grade of zero!

### **Course Delivery**

There will usually not be a formal lecture in this class. Presentations will be in the form of short videos, or slide shows. I will briefly introduce a topic for class, make a few comments, go over any pressing matters, and then turn you loose to work on one or more exercises. Exercises will be expected to be completed during class time, and handed in at the end of that class. You will be informed of deadlines. Occasionally we will have group exercises where teams will be allowed to work on an exercise. You will not be allowed to make up missed work except under unusual circumstances. If you know you will be gone for a class, be sure to let your instructor know beforehand, Failure to do so may result in **no credit** being given for missed work. If you miss an exam from an unexcused circumstance, the next exam you take will count double to make up for the missed grade!!!

### **Diagnostic Tests**

***These may occur at any time, and may be unannounced! DO NOT ATTEMPT TO MEMORIZE INSECT SPECIMENS used from our class materials.*** It is too easy for me to find and use unseen specimens for exams, so your time is better used learning the key characters of the insects you are responsible for knowing. You may expect to have many identification exercises. These serve to demonstrate you have learned how to recognize the different Orders and families we introduce to you, as well as give you experience in the use of identification keys. Whenever practical each student will receive his/her own set of specimens to work on. If you damage specimens during the course of an exam you may lose credit for that specimen. We do not have an infinite supply of good specimens with all parts present and visible. We may use specimens from your personal collections from time to time.

### **Written Exercises and Exams**

You will also have a number of written exercises. These may cover any topic covered during the course of this class. All tests are comprehensive, and may cover any handouts, quizzes, in-class exercise previously completed. ***You are expected to properly spell scientific names. There is no excuse for not properly spelling names that you can look up!!!! A misspelled name will result in being scored as an incorrect answer.***

### **Adult Insect Collection**

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This will be detailed in a separate handout. A word of caution, however. False or mislabeled specimens will be treated as examples of cheating. If you do not remember when and where you collected a specimen, throw it away! The importance of accurate labeling will be a topic of discussion.

**Graduate Student Project**

This will be detailed in a separate handout. Graduate students will be required to write a review paper on a topic assigned by the instructor.

**Supplemental readings (required for everyone)**

These articles cover a variety of topics. You are responsible for their content, and will be asked questions on exams directly related to these. **All of these may be found online if you search by title.** They will also be posted on our class web site online as .pdf files or as web page documents. You should download and print them out. Some will be used for in-class discussions. This will be announced. Others will be left to you to read and be prepared to answer questions about their content. **FYI** – indicates articles that are posted for your information only.

1. Frank, J. H. and E. D. McCoy. 1995. Precinctive insect species in Florida. Florida Entomologist 78: 21-35.(online at Florida Entomologist web site - <http://www.fcla.edu/FlaEnt/feissues.htm>)
2. **FYI** - Writing scientific papers - <http://entomology.ifas.ufl.edu/frank/KISS/>
3. Glossary of biocontrol expressions – online at <http://edis.ifas.ufl.edu/IN673> or <http://entomology.ifas.ufl.edu/frank/KISS/kiss21.htm>
4. Introduction to attack and defense: behavioral ecology of predators and their prey. endemics and epidemics of Shibboleths and other things Causing Chaos. J. H. Frank; E. D. McCoy. *The Florida Entomologist*, Vol. 73, No. 1. (Mar., 1990), pp. 1-9.
5. International Code of Zoological Nomenclature – read **Chapters 1, 3, 13, and 16** (<http://www.iczn.org/iczn/index.jsp>)
6. **FYI** -Zoological Record online – look at this site to see what the Zoological Record is and what it may be used for - <http://library.dialog.com/bluesheets/pdf/bl0185.pdf>
7. Alien Insects: Threats and implications for conservation of Galapagos Islands. C. E. CAUSTON, S. B. PECK, B. J. SINCLAIR, L. ROQUE-ALBELO,<sup>1</sup> C. J. HODGSON,<sup>4</sup> AND B. LANDRY. *Ann. Entomol. Soc. Am.* 99(1): 121-143 (2006).
8. Just How Imperiled Are Aquatic Insects? A Case Study of Stoneflies (Plecoptera) in Illinois. R. EDWARD DEWALT, COLIN FAVRET, and DONALD W. WEBB. *Ann. Entomol. Soc. Am.* 98(6): 941-950 (2005).
9. Arthropod footprints in the sands of time. Deyrup, M. 1990. Florida Entomologist 73(4): 529-538. (online at Florida Entomologist web site - <http://www.fcla.edu/FlaEnt/feissues.htm>)

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10. Biodiversity, past, present, and future and the future of taxonomy. Read articles in the section on Taxonomy, pp. 159-233.
11. Contributions to the Discussion on Electronic Publication - Bulletin of Zoological Nomenclature. 2009. 66(1). 4-19.
12. Cryptic *Gryllus* species - DAVID B. WEISSMAN, THOMAS J. WALKER, and DAVID A. GRAY. 2009. The Field Cricket *Gryllus assimilis* and Two New Sister Species. (Orthoptera: Gryllidae). Ann. Entomol. Soc. Am. 102(3): 367-380.
13. A zone of overlap and hybridization between *Allonemobius socius* and a new *Allonemobius* sp.. Ann. Entomol. Soc. Am. 101(1): 30-39. 2008
14. Irene Keller and Carlo R. Largiader. 2003. Recent habitat fragmentation caused by major roads leads to reduction of gene flow and loss of genetic variability in ground beetles. *Proc. R. Soc. Lond. B* (2003) 270, 417–423
15. Lee, M. S. 2004. The molecularisation of taxonomy. *Invertebrate systematics* 18: 1-6
16. McIntyre, N. E. 2000. Ecology of Urban Arthropods: A Review and a Call to Action. Ann. Entomol. Soc. Am. 93(4): 825-835.
17. NAOTO HARUYAMA, HIDESHI NAKA, ATSUSHI MOCHIZUKI,, and MASASHI NOMURA. 2008. Mitochondrial Phylogeny of Cryptic Species of the Lacewing *Chrysoperla nipponensis* (Neuroptera: Chrysopidae) in Japan. Ann. Entomol. Soc. Am. 101(6): 971-977.
18. Phylogeny of Basal Hexapod Lineages and Estimates of Divergence Times. Ann. Entomol. Soc. Am. 97(3): 411-419 (2004)
19. Hall, B. K. 2003. Descent with modification: the unity underlying homology and homoplasy as seen through an analysis of development and evolution. *Biol. Rev.* (2003), 78, pp. 409–433.
20. Osborn, H. F. 1902. Homoplasy as a law of latent or potential homology. *American Naturalist* 36:259-271.
21. Hall, B. K. 2007. Homoplasy and homology: Dichotomy or continuum? *Journal of Human Evolution* 52: (2007) 473-479.
22. The fundamental importance of taxonomy in conservation biology... *Invertebrate Systematics*, 2008, **22**, 139–149
23. Taxonomy, the Cinderella of science, hidden by its evolutionary stepsister. 2007. *Zootaxa* 1577: 1–2

## Administrative Issues

### Plagiarism

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

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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, as you will read on the Guide to Plagiarism website referenced below.

Plagiarism is unethical, unacceptable in science, and prohibited by the UF Student Honor Code (<http://www.dso.ufl.edu/sccr/honorcodes/honorcode.php>). 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 to be 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. All written papers will be checked using anti-plagiarism software called Turnitin® (<http://www.at.ufl.edu/~turnitin/about.html>).**

For further information and examples of plagiarism, I strongly suggest that you please read the George Smathers' Library Guide to Plagiarism at [http://www.uflib.ufl.edu/msl/services/tutorials/plagiarism/student\\_intro.html](http://www.uflib.ufl.edu/msl/services/tutorials/plagiarism/student_intro.html)

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

### **Academic Honesty:**

The University requires all members of its community to be honest in all endeavors. Cheating, plagiarism, and other acts diminish the process of learning. When students enroll at UF they commit themselves to honesty and integrity. Your instructor fully expects you to adhere to the academic honesty guidelines you signed when you were admitted to UF.

As a result of completing the registration form at the University of Florida, every student has signed the following statement:

*"I understand the University of Florida expects its students to be honest in all their academic work. I agree to adhere to this commitment to academic honesty and understand that my failure to comply with this commitment may result in disciplinary action up to and including expulsion from the University. "*

Furthermore, on work submitted for credit by UF students, the following pledge is

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either required or implied: *“On my honor, I have neither given nor received unauthorized aid in doing this assignment.”*

This policy will be vigorously upheld at all times in this course.

**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.

**Campus Helping Resources**

Students experiencing crisis or personal problems that interfere with their general well-being are encouraged to utilize the university’s counseling resources. Both the Counseling Center and Student Mental Health provide confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal or lacking clear career and academic goals, which interfere with their academic performance. The Counseling Center is located at 301 Peabody Hall (next to Criser Hall). Student Mental Health is located on the second floor of the Student Health Services in the Infirmary.

1. *University Counseling Center*, 301 Peabody Hall, 392-1575; personal and career counseling: [www.counsel.ufl.edu](http://www.counsel.ufl.edu)
2. *Student Mental Health*, Student Health Care Center, 392-1171, personal counseling: [www.hsc.ufl.edu/shcc/smhs.htm](http://www.hsc.ufl.edu/shcc/smhs.htm)
3. *Sexual Assault Recovery Services (SARS)*, Student Health Care Center, 392-1161, sexual assault counseling; and
4. *Career Resource Center*, Reitz Union, 392-1601, <http://edis.ifas.ufl.edu/IN673> <http://edis.ifas.ufl.edu/IN673career> development assistance and counseling.

**Students With Disabilities Act:**

The Dean of Students Office coordinates the needed accommodations of students with disabilities. This includes the registration of disabilities, academic accommodations within the classroom, accessing special

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adaptive computer equipment, providing interpretation services, and mediating faculty-student disability related issues.

*Dean of Students Office, 202 Peabody Hall, 392-7066, [www.dso.ufl.edu](http://www.dso.ufl.edu)*