I. OBJECTIVES

To explore the taxonomy and behavior of freshwater aquatic invertebrates, with an emphasis on aquatic insects. The role of aquatic invertebrates in food webs, as well their utility in aquatic conservation and restoration issues, will also be an important component of the course.

II. COURSE CONTENT

The course consists of several major segments related to aquatic invertebrates:

1. Morphology and anatomy.
2. Structures, taxonomy, and phylogeny.
5. Diversity and community composition.

III. COURSE STRUCTURE

One class meeting per week (Tuesday, 5:00 – 7:45 pm). Class meetings will consist of a mixture of lectures, laboratory activities, and field trips.

IV. LABORATORY AND FIELD ACTIVITIES

Field trips and laboratory activities will focus on developing identification skills. The primary purpose of field trips will be to collect and observe aquatic invertebrates in their natural habitats. Please read the appropriate information (available on Canvas) before attending each class meeting and bring any handouts with you. Waders, boots, or other wading shoes will be available for the field trips. However, if you prefer your own, please bring them with you. Students should have a laboratory notebook and a calculator. Participation in all class activities is expected.
V. INSTRUCTOR

Dr. Mažeika Sullivan, Heffner 125; Phone/voice mail: (614)688-8402; email: sullivan.191@osu.edu. Note: when emailing me, please include AQUATIC INVERTS in the Subject. Office Hours: Mon 10:00 – 11:30am, or by appt.

TA: Kristen Diesburg, Kottman 465B; Phone/voice mail/text: (513)382-7029; email: diesburg.1@buckeyemail.osu.edu. Office Hours: Mon 3:30 – 5:30pm, or by appt.

VI. GRADING

Attendance and Participation: 20%
Presentation: 20%
Quizzes: 20%
Collection Catalog & Field Notebook: 40%

VII. SCHEDULE OF LECTURE TOPICS

Subject to adjustments; please check Canvas for updates.

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Readings</th>
</tr>
</thead>
</table>
| 1    | 08/23  | Class Introduction
Intro to Aquatic Invertebrate Ecology
Emerging Aquatic Insect Traps | Text: Chapter 1                  |
| 2    | 08/30  | Sampling Devices, Morphology, Anatomy
Terminology
Taxonomy & Introduction to Phylogeny
Field Collection | Text: Chapters 2, 3
Lab Manual: Labs I - II |
| 3    | 09/06  | Dichotomous Keys, General Classification
Life History & Ecology of Aquatic Insects
Field Collection
Identification | Text: Chapters 5, 6, 9
Lab Manual: Lab III |
|      | 09/13  | Biomonitoring
Habitats & Sampling with Ohio EPA
(Highbanks) | Text: Chapter 7                  |
| 4    | 09/20  | Quiz #1
COLLEMBOLA (Springtails)
EPHEMEROPTERA (Mayflies)
Adaptations, Respiration
Field Collection | Text: Chapters 4, 8, 10, 11
Lab Manual: Labs IV-V |
| 6    | 09/27  | Odonata (Dragonflies & Damselflies)
Orthoptera (Grasshoppers & Crickets)
Field Collection
Identification | Meet at 6:00pm
Text: Chapters 12, 13
Lab Manual: Labs VI-VIII |
| 7    | 10/04  | Quiz #2
Plecoptera (Stoneflies)
Hemiptera (Aquatic True Bugs)
Identification | Text: Chapters 14, 15
Lab Manual: Labs IX – X, XIII |
| 8    | 10/11  | Megaloptera (Dobsonflies & Alderflies)
Neuroptera (Spongillaflies) | Text: Chapter 16
Lab Manual: Lab XIV |
<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
<th>Text/Manual</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/18</td>
<td>Field Collection Identification</td>
<td>TRICHOPTERA (Caddisflies) Text: Chapters 17, 18 Lab Manual: Lab XV</td>
</tr>
<tr>
<td>10/25</td>
<td>Field Collection - TBD</td>
<td></td>
</tr>
<tr>
<td>11/01</td>
<td>Quiz #3</td>
<td>LEPIDOPTERA (Aquatic Moths) Text: Chapters 19, 20 Lab Manual: Labs XVI, XIX - XXI</td>
</tr>
<tr>
<td></td>
<td>Field Collection Identification</td>
<td>COLEOPTERA (Aquatic Beetles)</td>
</tr>
<tr>
<td>11/08</td>
<td>Field Collection Identification</td>
<td>DIPTERA (Aquatic True Flies) Text: Chapters 21, 22 Lab Manual: Labs XXII – XXVI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HYMENOPTERA (Wasps)</td>
</tr>
<tr>
<td>11/15</td>
<td>Specimen Verification with Ohio EPA</td>
<td></td>
</tr>
<tr>
<td>11/22</td>
<td>No class – open lab for identification</td>
<td></td>
</tr>
<tr>
<td>11/29</td>
<td>Patterns of Community Diversity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Trophic Dynamics &amp; Food Webs</td>
<td></td>
</tr>
<tr>
<td>12/06</td>
<td>Quiz #4</td>
<td>Class wrap-Up</td>
</tr>
</tbody>
</table>

**VIII. Course Material**

*Textbooks:*

2. Taxonomy of Aquatic Insects Laboratory Manual (5350.01) – will be available electronically in class (REQUIRED).


*Class Website:*
1. Canvas will be used extensively during the class. Please check Canvas consistently during the course of the quarter for class updates and reminders, lab assignments and other postings, and grades.

**IX. Quizzes**

Quizzes will cover readings from the text, material from lectures and class presentations, and laboratory identification (practical) sections (including sight identifications and keying parts). Quizzes will be given at the end of appropriate thematic breaks. Habitat, behavioral, and trophic relationship information may be asked of each specimen identified by sight. There will be NO comprehensive final.

**X. Guidelines for Presentations**

Each student pair will prepare a summary handout and a class presentation (~20 min) on an assigned taxonomic group (order). Details and a presentation schedule will be presented in class. Graduate students will be expected to present alone.
XI. COLLECTION CATALOG AND FIELD NOTEBOOK

Your collection of aquatic insects and field notebook are required and constitute 40% of your final grade. The purpose is to give maximum experience with aquatic insect taxonomy. You must collect all specimens yourself and collect them during this semester. However, you may work with others in collecting and identifying the insects. You will be provided with specimen vials, preservative, and labeling paper and tape. You may check out collection equipment (nets, screens, bottom samplers) from the laboratory. Specimens are to be preserved in 70% ethyl alcohol and stored in 2- or 4-dram vials (screw-top). You must thoroughly label each specimen vial with a location label (name of waterbody, state and county, UTM, sampling date, name of collector), taxonomic label (order, family, genus, species, life stage), and ecological label (habitat, functional feeding group, mode of existence). It is useful to have a series of individuals representing a species in a vial.

Example of labels:

<table>
<thead>
<tr>
<th>Locality label</th>
<th>Taxonomic Label</th>
<th>Ecological Label</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scioto River</td>
<td>Order: Trichoptera</td>
<td>ex. rock surface</td>
</tr>
<tr>
<td>USA: OH, Franklin County</td>
<td>Family: Hydropsychidae</td>
<td>in riffle zone</td>
</tr>
<tr>
<td>UTM COORDINATES HERE</td>
<td>Hydropsyche simulans</td>
<td>FFG: filtering-collectors</td>
</tr>
<tr>
<td>08/25/2012</td>
<td>larval</td>
<td>MOE: clingers</td>
</tr>
<tr>
<td>Collector: B.B Buckeye</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The collection will be evaluated for accuracy of identifications and curatorial techniques. Prepare a typed checklist of taxa arranged phylogenetically using the sequence used in your lab manual (see pp. 32-33). Use a hierarchical scheme, listing order, family, genus, and species when known.

Example of typed checklist:

I. EPHEMEROPTERA
   1. Baetidae – *Baetis* sp.
   1. Baetidae – *Callibaetis* sp.
   2. Ephemeraeidae – *Ephemera* sp.

II. PLECOPTERA
   3. Chloroperlidae – *Sweltsa* sp.
   4. Pteronarcyidae – *Pteronarcella* sp.
   5. Etc.

III. ETC.
IV. ETC.

*Note:* Number the families consecutively 1-X for your entire checklist. If you turn in more than one genus, use the same number for the family as in the example above under I. EPHEMEROPTERA.

Evaluation of collections will be based on (1) accuracy of identifications, (2) curatorial techniques (i.e., alcohol levels, proper labeling), and (3) number of orders, families, and genera submitted. **The target is 10 orders, 55 families, and a minimum of 10 genera among four orders.** A total of 50 points will be awarded to curation. Grading will be based on the number of different specimens and the level of taxonomic identification as follows:
<table>
<thead>
<tr>
<th>Taxonomic Resolution</th>
<th>Points</th>
<th>Target #</th>
<th>Target Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order</td>
<td>1</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Family</td>
<td>2</td>
<td>55</td>
<td>110</td>
</tr>
<tr>
<td>Genus</td>
<td>3</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>*Species</td>
<td>4</td>
<td>(Only if verified by expert.)</td>
<td></td>
</tr>
<tr>
<td><strong>Rare group or exotic species</strong></td>
<td>5</td>
<td>(Based on instructor discretion.)</td>
<td></td>
</tr>
<tr>
<td>Curation</td>
<td>0-25</td>
<td>50</td>
<td>50</td>
</tr>
</tbody>
</table>

- Target Total of 200 pts = 100%.
- Errors: Taxonomic errors = (-1) x value of taxon.
- More orders, families, and genera will add more points to the total, allowing a possible 100% even if you make a few identification errors.

Your field notebook should be turned in with your collection. “Rite in the Rain” All-Weather Field notebooks are a good choice. Notebook entries should generally include descriptions of collection sites; where, when, and how sampling was conducted; weather and water conditions (e.g., turbidity, flow, etc.), riparian vegetation, and your overall impressions. Entries must be legible and written in pencil. Feel free to be creative and include sketches, photos, etc.

XII. ACADEMIC MISCONDUCT

Academic integrity is essential in maintaining excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the University’s Code of Student Conduct, and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the University’s Code of Student Conduct and this syllabus may constitute “Academic Misconduct.”

The Ohio State University’s Code of Student Conduct (Section 3335-23-04) defines academic misconduct as: “Any activity that tends to compromise the academic integrity of the University, or subvert the educational process.” Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the University’s Code of Student Conduct is never considered an “excuse” for academic misconduct. Please review the Code of Student Conduct and, specifically, the sections dealing with academic misconduct.

If I suspect that a student has committed academic misconduct in this course, I am obligated by University Rules to report my suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the University’s Code of Student Conduct (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the University.

XII. DISABILITY

Students with disabilities that have been certified by the Office for Disabilities Services will be appropriately accommodated, and should inform the instructor as soon as possible of their needs.