

University of Wisconsin - La Crosse
Department of Biology

Biology 414 / 514

Freshwater Invertebrate Zoology

Syllabus

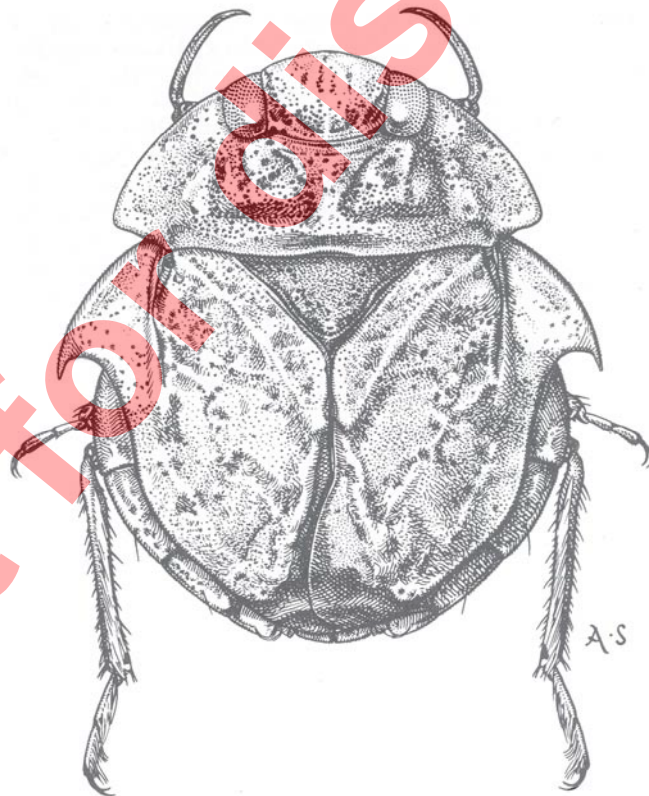


TABLE OF CONTENTS

COURSE JUSTIFICATION	3
Syllabus.....	4
Course Description	4
Prerequisites: BIO 210 or BIO 341	4
Objectives of course.....	4
The student should:.....	4
General Information	5
Instructor	5
Office Hours.....	5
Meeting Times.....	5
Texts & Readings.....	5
Electronic Mail & The "FIZ" Homepage on Desire 2 Learn (D2L).....	5
Lecture Examinations	6
Grading	6
Student Macroinvertebrate Collection , Graduate Review Papers & Scientific Writing	6
Tentative Lecture Schedule.....	11
Laboratory.....	12
Laboratory Use Policy & Supplies.....	12
Field Trips	14
Laboratory Schedule.....	15

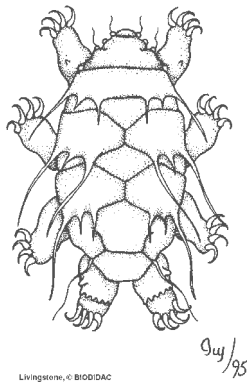
COURSE SYLLABUS & LOGISTICS

COURSE JUSTIFICATION

Freshwater Invertebrate Zoology is a core topic in aquatic science. This course will satisfy traditional needs in taxonomic competence and ecological methodology for students entering natural resource professions. In addition, this course will provide students with the training needed to understand, conduct, and critically evaluate the use of freshwater invertebrates in Biological Monitoring/Assessment Protocols. These protocols are currently being implemented across the country as a means of evaluating water quality and establishing attainment standards. An underlying goal of this course will be to provide students with a set of quantitative tools and an ecological foundation, which will enable them to address the environmental challenges facing our nation's freshwater resources.

1) Potential degree programs served by this course:

- Biology major, Aquatic Science Concentration
- Biology major, Environmental Science Concentration
- Education major, Middle/Secondary Education
- Recreation Management



Syllabus

Course Description

This course introduces the ecology and taxonomy of the metazoan, non-parasitic freshwater invertebrates. An extensive course designed to provide a foundation for taxonomic knowledge, and basic understanding of the biology and ecology of freshwater invertebrates. The course is designed for advanced students in aquatic and environmental sciences. Lectures will focus on ecology, labs on taxonomy and quantitative skills. Completion of an individual macroinvertebrate collection will also be required.

Prerequisites: BIO 210 or BIO 341

Objectives of course

The student should:

- 1) Develop taxonomic skills necessary for the identification and classification of freshwater invertebrates emphasizing the fauna of the Paleozoic Plateau ("Driftless Area").
- 2) Understand freshwater invertebrate anatomy and physiology across phyla with an appreciation of form and function.
- 3) Understand the ecology of lotic and lentic invertebrates at the population, community and ecosystem levels.
- 4) Develop quantitative skills necessary for basic invertebrate field research, aquatic biomonitoring protocols, and invertebrate ecotoxicology.

"In the end,
We will conserve only what we love,
We will love only what we understand,
We will understand only what we are taught."

BABA DIOUM, Senegalese Conservationist

General Information

Instructor

Roger J. Haro, Ph.D.
4028 Cowley Hall
Office Phone & Voice Mail: 5-6970
E-mail Address: haro.roge@uwlax.edu
Desire 2 Learn (D2L) URL: <https://uwlax.courses.wisconsin.edu/>

- 1) Use your regular UW-L e-mail username login, but use your student ID as an initial password
- 2) Then choose "• [BIO 414/514, s001, Fall 2004 \(Freshwater Invertebrate Zoology\)](#)" from under "My La Crosse Courses"

Office Hours

Monday 2:15 p.m. - 4:15 p.m.
Wednesday 2:15 p.m. - 4:15 p.m.

Meeting Times

Lecture Section: 001 - M & W 7:45 - 8:40 a.m. in Rm 301 CH
Laboratory Sections: L51 - W 8:50 - 10:50 a.m. in Rm 316 CH

Texts & Readings

- 1) Thorp, J. H. and Covich, A. P (eds.) 2001. Ecology and Classification of North American Freshwater Invertebrates, Second Edition. Academic Press, Inc. (Available at UWL Textbook Rentals)
- 2) Hilsenhoff, W. L. 1995. Aquatic Insects of Wisconsin. Keys to Wisconsin Genera and Notes on Biology, Habitat, Distribution and Species. Natural History Museum Council, Univ. Wisconsin-Madison, Coop. Ext. Publications. (Available at UWL Bookstore)
- 3) BIO 453/653 - Haro Course Packs. Distributed, in parts, over the semester from the instructor. (See the section below titled Electronic Mail & the FIZ Homepage)
- 4) Reserve Collection for course readings at Murphy Library. Special readings and articles will be assigned at the instructor's discretion. These materials will be available at the Circulation Desk at Murphy Library. There will be a two-hour limit to each loan period.

Electronic Mail & The "FIZ" Homepage on Desire 2 Learn (D2L)

All students will be required to acquire and use their **university electronic mail accounts** and the D2L web course system. Course announcements and updates will be commonly distributed through the D2L course website. It is the student's responsibility to regularly check his/her electronic mailbox and the course URL for such items. I use e-mail daily and will be most

accessible outside of class and at times other than my assigned office hours via this network. Please take advantage of the network. Questions about the use of your e-mail accounts should be directed to the ITS Support Center, room 103 Wing - just inside the main entrances, (phone number: 5-8774; e-mail: itssupport@uwlax.edu). Course materials will be distributed from the Freshwater Invertebrate Zoology Homepage as listed in the above section.

Lecture Examinations

Lecture examinations will be a combination of "short answer" and essay questions.

Grading

Assessment/Assignment	Percentage of Grade	Percentage of Grade
	Undergraduate Students	Graduate Students
■ Lecture – Exam 1	13.5	12
■ Lecture – Exam 2 (During Finals Week, Non-Comprehensive)	13.5	12
■ Laboratory Practical Identification Tests (3 @ 100 points ea.)	40	35
■ Macroinvertebrate Collection ¹	33	29
■ Research Project (Graduate Students Only)		13
■ Total	100	100

Student Macroinvertebrate Collection , Graduate Review Papers & Scientific Writing

Supplies. A collection of aquatic macroinvertebrates will be required as a part of this course. The collection will represent approximately 30% of your final grade. Collections will be preserved in ethyl alcohol and stored in glass 4 dram screw-top vials (polyseal tops are best). You will need about 50-70; these can be purchased from the UW-L Book Store. Alcohol, labeling materials, and general laboratory equipment will be provided in the Lab.

¹ See the section titled "Macroinvertebrate Collection" for a more detailed breakdown of the grading procedure for this assignment.

Grading. Grading of the collections will be based upon the number of different specimens and the level of identification as follows:

Taxa*	Points
Phylum	5
Order	2
Family	4
Genus	5
Species	6

*additional life stages (i.e., pupa, adult) 1 additional point

Percentage Breakdown for the Collection:

Component	% of Score
Taxonomic Identification	70
Curatorial presentation	20
Data base management	5
Field book	5

Incorrect identifications (at any level) will be penalized 4 points each, so don't make wild guesses!

Specimen Labels. Each specimen must contain a label carrying the following information:

Front: Taxonomic Information

Order

Family (if applicable)

Genus (if applicable - must be italicized or underlined)

species (if applicable - must be italicized or underlined - if no species, then Genus sp.)

(if applicable)

life stage (egg, larva, pupa, adult)

person determining taxonomic ID

Back: Collection Location

Country, State, County

water body and landmark (road, city, other locational information)

lat/long and/or TRS information (if available)

Date collected

Collectors' name

Label Example

Odonata

Gomphidae

Ophiogomphus rupinsulensis

Larva

det. R. Haro

USA: Wisconsin, La Crosse Co.

Spring Coulee Creek @ County Road P

43° 41' 30.25" N 90° 56' 14.79" W

30 January 2001

coll. R. Haro

Permanent labels should be written with India ink or Black Pigma Micron 01 pen. I will have several Pigma pens available in the lab. These labels can be created with word processors and laser printers, but the long-term archival quality of laser print on paper in alcohol storage has yet to be demonstrated. Further, do NOT print labels on ink-jet printers, as the alcohol will dissolve the ink.

Field Notebook

A field notebook must be turned in with the collection. The notebook should contain site descriptions for each collecting trip made, description of collecting activities (collection gear, habitats collected etc.), and a list of the taxa found at each site.

Additional Equipment. The following equipment are also recommended. Most of these items will be available on check-out basis through the lab. Any unreturned items will be charged to the student.

- * forceps- Watchmaker straight BB ex-sharp fine points
- * Watchmaker straight fine sharp pt 4"
- * dissecting needles- 6" straight, wood handle
- * 6" angular, wood handle
- * Drafting Pen
- * small hand lens

Graduate Review Papers & Research Projects

Graduate students will also prepare an individually-written review paper focusing on a specific macroinvertebrate genus or a relevant topic in freshwater invertebrate biology or an instructor-approved research project. All genera/topics/projects must be approved by the end of class on Wednesday, September 29, 2003. The papers will be 10 single-sided pages, not including bibliography. Lines will be double spaced and must be printed from a word processor with a Times-Roman or Arial 11 pt font. The format should follow the style used by the Journal of the North American Benthological Society (the NABS Guide to Authors can be viewed on the WWW at: <http://www.benthos.org/jnabs/online.asp>). The Department of Biology also has a new Communication in the Biological Sciences Web site to help with a range of communication questions: from effective way to answer essay questions on exams to preparing a cohesive oral presentation. The site can be accessed at <http://www.uwlax.edu/biology/communication/homepage.htm>. I encourage you visit this site often.

Writing a scientific review or paper on a particular subject requires understanding of the scientific literature in a more thorough way than is the case if, for example, you were reading a general textbook for facts that may be asked for in an examination. As one reviews the literature, one gains an appreciation for possible loopholes and gaps in the work reported. One also develops a critical facility to think that serves one both in science as well as in normal activities.

Scientists are human and subject to human frailties. What they write is not infallible and can be wrong occasionally. Moreover, science can be interpreted in different ways. Evaluation of these various interpretations is one of your responsibilities as you read and prepare a written report.

Secondly, the information read in the literature must be conveyed accurately in your writing. Precise writing is a difficult ability, but one can improve upon that ability with practice. Science demands rigor and accuracy; writing is a skill that can greatly enhance that rigor.

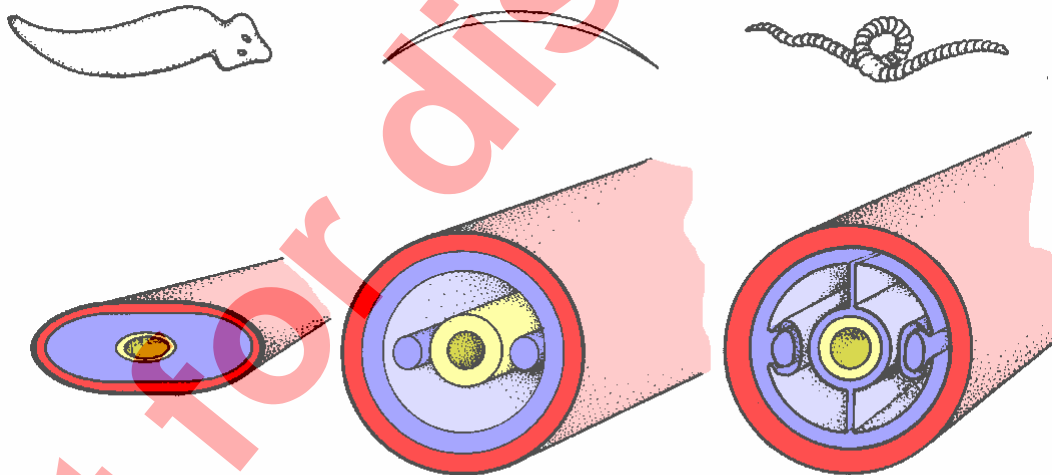
Research is quite incomplete until the results are synthesized and interpreted in written form. One can present results orally, but these results are often only figuratively gaseous. Published communication is the concluding phase of research and a mandatory responsibility of scientists. Obscure writing, however, abounds in all literature, and scientific writing is not an exception. As scientists, we have a responsibility for competent communication.

Prolixity is not only mentally taxing; it is expensive as well. In the few years (months?) remaining before most text becomes electronic, each word for printed publication costs about 50 cents. At that price, one quickly recognizes the cost of, for example, "The majority of" (= Most), "commences its predatory activity" (= begins to feed), "a saturated water situation" (= wet), etc.

Only rarely should one quote sentences and paragraphs from references. My objectives are to evaluate your understanding and interpretations of the material written.

The more obscurely a passage is written, the greater is the possibility for interpretative error. Examples are many. The title should be concise, and tell you something precisely about the subject. Construct an outline of each point to be made so that your paragraphs can bring order out of potential chaos. In reviewing the many drafts necessary prior to the final draft, examine each sentence for sense, spelling, and grammar. Good grammar and punctuation are essential to precise writing and expression of concepts. Much of genius is an extraordinary capacity for detail.

For ambitious students, a research project option is also possible. Please make an appointment with me very early in the semester if you would like to pursue a project instead of a review paper.



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9/4/94

Tentative Lecture Schedule

Lecture	Topic
1.	Introduction to the freshwater invertebrates and Evolution in the Freshwater Medium (1)
2.	Evolution in the Freshwater Medium (2)
3.	Overview of freshwater habitats NO LECTURE ON SEPTEMBER 20TH
4.	Introduction to the Aquatic Insects & Colembola
5.	Odonata: Anisoptera
6.	Special Topic: Estimation of Invertebrate Production
7.	Odonata: Zygoptera
8.	Ephemeroptera (1)
9.	Ephemeroptera (2)
10.	Plecoptera (1)
11.	Plecoptera (2)
12.	Hemiptera
13.	Special Topic: Ecology & Analysis of Adult Aquatic Insects
14.	Midterm (Tentatively scheduled for 10/27/2003)
15.	Megaloptera, Neuroptera & Trichoptera (1)
16.	Trichoptera (2)
17.	Coleoptera (1)
18.	Coleoptera (2)
19.	Diptera (1)
20.	Diptera (2)
21.	Minor Phyla
22.	Annelida
23.	Crustacea I
24.	Crustacea II
25.	Gastropoda
26.	Bivalvia
27.	Special Topic: Freshwater Invertebrates in Environmental Biomonitoring Protocols (1)
28.	Special Topic: Freshwater Invertebrates in Environmental Biomonitoring Protocols (2)

Laboratory

Laboratory Use Policy & Supplies

Laboratory Rules

The Bio 414/514 laboratory is an important part of the Freshwater Invertebrate Zoology course. I have set a few important guidelines. It is essential that you follow the rules and procedures for the use of the Bio 414/514 laboratory equipment and facilities at all times.

- Use extreme caution with the instructional collection. This collection is constantly under construction and we have a very limited supply of invertebrate examples. Please take great care with the materials and inform me at once should you notice a damaged specimen. I will cover proper collection use during the first laboratory session.
- Before using any stereo or compound microscopes, make sure the lenses and stage are clean and that the low power objective (10X) or scanning objective (4X) is in place on the compound microscopes. Also verify that the rheostat controlling the intensity of the illuminators (i.e., the fiber optic light sources for the stereo microscopes or the built-in light on the compound microscopes) is in the lowest position (number 1 on the dial) before you turn on the switch. Notify me at once if you have any difficulty with the microscopes or light sources.
- Before returning the microscopes to their cabinets, make sure that:
 - 1) Any slides have been removed and that the stage and lenses are clean.
 - 2) The rheostat (the rotary switch used to adjust the light intensity) is turned to its lowest position (number 1 on the dial) and that the light-switch is turned off.
 - 3) The power (shortest) objective is left in place.
 - 4) The lowest power cord has been neatly wrapped around the base of the scope in a counterclockwise direction (compound microscopes only).
 - 5) The left-right arm of the mechanical stage is centered on the compound microscope.
- **Before you leave**, make sure your area and any dissecting tools you have used are clean and that your **chair is shoved back completely under the desk**. Also make sure any instructional collection material is replaced in its proper storage site, is properly sealed, and has enough preservative.

Procedure

- Laboratory materials consist of prepared microscope slides, preserved specimen in vials, demonstrations, charts, diagrams, etc.
- You may work individually or with a lab partner on any material.
- Some dissection equipment will be provided, however, you are encouraged to purchase a dissection kit from the bookstore for your fieldwork (cost ca. \$11.50). A field notebook, preferably a "Rite in the Rain" Weatherproof notebook (available at the UW-L Bookstore) should be purchased for field notes and for use with your student collection. All field

gear, specimen containers, preservative, and labeling material will be provided by the course.

- Always bring your textbooks to lab; the diagrams, drawings, photographs, etc. will be used from time to time to supplement those provided in the progressive lab manual.
- A progressive lab manual will be distributed via the D2L Course Site to you prior to each laboratory session. More details about this will follow. The lab manual will cover classification, morphology, vocabulary, and taxonomic diagnoses. This lab manual should also be brought to each laboratory session. It may be helpful to store this material in a loose-leaf, three-ring binder.
- Specialized taxonomic keys for detailed diagnoses beyond the scope of your texts are available on a limited “check-out” basis. See me for more details.

Laboratory Practical Examinations

- Laboratory points will come from three practical exams.
- Lab exams use a “musical chairs format” in which you will have one minute per station, with one turn at each station and no opportunity for going back for a second look.
- **Spelling counts!** Twenty-five % will be deducted from your point score for misspelled scientific names (Note: **Failure to underline scientific genera and species will result in the loss of all possible points!**).
- The information you are responsible for will come from the text and any preserved specimen, demonstrations, models, charts, diagrams, etc. we cover in the laboratory.
- An outline of the material you are responsible for will be provided in the lab manual. You will also be responsible to know specific functional and ecological questions associated with specimen. This material will be drawn from the text, the lab manual, and my laboratory lectures.
- Practical examination material could include naming a structure, organism, etc. shown under a microscope placing an organism in its correct taxonomic group, identifying pinned structures on dissections, giving the function of any anatomical structure, or providing information about specific organisms covered in the lab manual.
- Always make your answers complete. For example, you will not get credit for answering “gill” when the answer is “coxal gill” (a specialized respiratory extension of the exoskeleton on certain stonefly larvae).
- Make sure you answer the question asked. For example, you will not receive credit for answering “Plecoptera” if the question asks “what is the structure shown under the pointer?” and it happens to be the paraglossae located in the ventral head region of a stonefly larvae.

Review Times

- The lab will be open for unstaffed review and survey work-ups at times when other courses using 316 Cowley. Your names will be given to Campus Security for permission to be in 316 Cowley outside of class hours. If the laboratory is locked, you may call security for access. You may be required, however, to show proper student identification.

Freshwater Invertebrate Zoology will be sharing this laboratory room with Limnology (Bio 341 Dr. Saros), Parasitology (Bio 406 Dr. Sutherland), and QME (Bio 419 Dr. Tyser) this semester. Room 316 will not be open to Bio 414/514 students while these courses hold their sections. These other instructors and I will also restrict access to the laboratory during laboratory preparation and on anytime prior to a laboratory practical. We reserve the right to restrict access to the lab at any time. Please be respectful of these other courses and leave your work area clean upon exiting the lab.

Period	Monday	Tuesday	Wednesday	Thursday	Friday
7:45 AM					
8:50 AM			Bio 414/514 (L51)		
9:55 AM			FIZ	Bio 419 (L51)	
11:00 AM					
12:05 PM					
1:10 PM					
2:15 PM	Bio 406/506 (L51)	Bio 341 (L51)	Bio 406/506 (L51)	Bio 341 (L51)	
3:20 PM					
4:25 PM					
5:30 PM					
6:35 PM					
7:40 PM					

- **Nothing** is to be removed from the laboratory during review (or any other) times, and all rules and procedures must be followed (i.e., the lab must be left in a clean condition, etc.). All review material must be replaced in its proper vials and racks. Misplacing the review specimens will result in the removal of the collection for reprocessing and will prevent the class from receiving adequate review opportunities.
- **Any violation of the above rules will lead to immediate elimination of review times.**

Field Trips

Two to three field trips will be scheduled for this semester. We will be taking a weekend field trip to the Pigeon Lake Field Station in Northern Wisconsin on Sept. 17 -19. Two other local trips will occur. We will collect in La Crosse Marsh in and around the "rabbit trail" on the morning of Oct. 2nd. If time and conditions permit we will also sample Mississippi River backwaters at Goose Island on the morning of October 16th. Your attendance is required for all trips. Please note the tentative dates of these field trips and plan ahead for them. We will typically disembark from Parking Lot C in front of Cowley Hall. Punctuality in the lot at the pre-announced time of departure is your responsibility. Please be prepared for the weather and for fieldwork. You should bring your collecting materials, notebooks, a lunch or snack, hot liquids to drink, and waders (the Department no longer maintains waders for checkout). I will provide further details prior to the trip dates. Finally, as upper division and graduate students, I expect your cooperation and attention on these trips to ensure, first and foremost, the **SAFETY** of all; a good learning experience; and a **whole lot of fun**.

A course fee has been assessed to cover the cost of the transportation and lodging to the Pigeon Lake Field Station.

Laboratory Schedule

Week	Date	
II.	Sep. 8	Introductory material; microscopy; External Anatomy
III.	Sep. 15	Aquatic Insect Order Survey
	Sep. 17	* Weekend Field Trip: Pigeon Lake (No Lecture on Monday, Sept. 20 th)
IV.	Sep. 22	Odonata
V.	Sep. 29	Ephemeroptera & Collection Work-up
	Oct. 2	* Saturday Field Trip: Myrick Marsh
VI.	Oct. 6	Lab Practical I & Collection Work-up
VII.	Oct. 13	Hemiptera & Collection Work-up
	Oct. 16	* Saturday Field Trip: Goose Island
VIII.	Oct. 20	Plecoptera
IX.	Oct. 27	Megaloptera & Trichoptera (Image Analysis Techniques)
X.	Oct. 8	Lab Practical II & Collection Work-up Lab Practical I
XI.	Nov. 10	Coleoptera & Collection Work-up
XII	Nov. 17	Diptera & Chironomid taxonomy (slide mounting techniques)
XIII.	Nov. 24	No Lab this week due to Thanksgiving
XIV	Dec. 1	Collection Work-up*
XV	Dec. 8	Lab Practical III & Collection Work-up*
	Dec. 15	Collection Work-up (Collections due on December 16th at noon in 316 Cowley Hall)

