Outline Aquatic Entomology Entomology 8940
Spring Semester 2006

Lecture = 9:30 – 10:45 Tuesday, Laboratory = 9:30 – 12:15 PM on Thursday – note that on most lab days about 30minutes to1 hr will consist of lectures on that particular group of aquatic insects.

January 10 – Lecture – Introduction, metamorphosis, respiratory Adaptations
January 12 – Lab – Orders, plus Ephemeroptera, Odonata

January 17 – Lecture – Osmotic regulation, generalized life histories
January 19 – Lab – Ephemeroptera, Odonata, Plecoptera

January 24 – Lecture – Sampling, methods and habitats
January 26 – Lab - Ephemeroptera, Odonata, Plecoptera, Hemiptera

January 31 - Lecture - functional vs taxonomic groups, food resources & feeding
February 2 - Lab - Ephemeroptera, Odonata, Plecoptera, Hemiptera, Megaloptera, and Neuroptera

February 7 - Lecture – relationship between stream, watershed and functional feeding groups, shredder-detritivores, shredder-herbivores, scrapers, collector-gatherers, filterers, predators, etc. (note during a 4+ week period we will cover examples of each functional group, influence of local geomorphology, behavioral adaptations to various microhabitats, factors influencing distributions, as well as "ecological role" of each functional feeding group.
**February 9 - Lab – First laboratory quiz (Ephemeroptera, Odonata, Plecoptera, Hemiptera)

February 14 - Lecture – relationship between stream, watershed and functional feeding groups, shredder-detritivores, shredder-herbivores, scrapers, collector-gatherers, filterers, predators, etc. (note during a 4+ week period we will cover examples of each functional group, influence of local geomorphology, behavioral adaptations to various microhabitats, factors influencing distributions, as well as "ecological role" of each functional feeding group. (it will be different than the Feb 7 lecture)
February 16 - Lab – Trichoptera

February 21 - Lecture – continuation of Feb 7 and Feb 14 .
February 23 – Laboratory (Trichoptera)

February 28 - Lecture – continuation of 7-14 February.
March 2 - Lab - Trichoptera, Lepidoptera, or field trip (weather permitting)

**March 7 - Lecture – Midterm exam
March 9 - Lab – Field trip (weather permitting), or Trichoptera, Lepidoptera and work on personal collections

Monday March 13 to Friday March 17th –Spring Break Week

March 21 - Lecture – continuation of Feb 7 and Feb 14.
**March 23 - Lab - Trichoptera, Lepidoptera, and Coleoptera – **1st half of collection due**

March 28 – Lecture –Applied aspects of aquatic entomology including biotic indices,
March 30 – Lab - Trichoptera, Lepidoptera, Coleoptera, start Diptera

April 4 – Lecture –Secondary production, History, Methods, and Application
April 6 – Lab - Trichoptera, Lepidoptera, Coleoptera, and Diptera - plus miscellaneous small orders, review, work on personal collections March 30 – Lecture – Secondary production of aquatic insects

April 11 – Lecture – Secondary production, trophic basis of production, energetics
**April 13 – Lab – Work on Personal collections

April 18– Lecture – Secondary production, trophic basis of production, energetics
**April 20 – Lab – Laboratory Collections due

April 25 – Lecture – Student presentations (about 10-15 minutes each) – Continue in Late afternoon and evening – Wallace pays for the pizza.
**April 27 – Laboratory – Final Laboratory Exam

May 1st Last Day of Classes

**Final Exam Schedule = Thursday, May 4, 2006 (Kent State Memorial Day) – at 8:00-11:00 AM in this room.

AQUATIC ENTOMOLOGY
ENTOMOLOGY 8940
Texts and some other useful books:

**Text#1:** Merritt, R. W. and K. W. Cummins (eds.). 1996. An Introduction to the Aquatic Insects of North America, 3rd ed. Kendall/Hunt Publ. Co. Dubuque, Iowa. 862 pp. (new edition coming out later this year)

**Text#2:** Allan, J.D. 1995. Stream Ecology: Structure and Function of Running Waters. Chapman & Hall, London. 388 pp.

Other useful books:

**Berner, L. and M.L. Pescador. 1988. The Mayflies of Florida (revised edition). University Presses of Florida, Tallahassee and Gainesville. 415 pp. (primarily for Coastal Plain of Georgia)

**Brigham, A. R., W. U. Brigham, and A. Gnilka (eds.). 1982. Aquatic Insects and Oligochaetes of North and South Carolina. Midwest Aquatic Enterprises, Mahomet, Illinois. 837 pp. (Very useful for southeastern U.S.)

Cushing, C. E., K. W. Cummins, and G. W. Minshall (eds.). 1995. Ecosystems of the World Vol.22: River and Stream Ecosystems. Elsevier, Amsterdam. (Very expensive = ca. $235)

Edmondson, W.T. (ed.). 1959. Freshwater Biology (2nd ed.). John Wiley & Sons, 1248 pp. (Keys are sadly out of date for most aquatic insect groups).

**Edmunds, G.F., S.L. Jensen, and L. Berner. 1976. The Mayflies of North and Central America. Univ. Minnesota Press, Minneapolis. 330 pp.

Stan V. Gregory, Kathryn L. Boyer, and Angela M. Gurnell, eds. 2003. The ecology and Management of Wood in World Rivers. American Fisheries Society. Bethesda Maryland, 444 pgs.

Hackney, C.T., S.M. Adams, and W.H. Martin (eds.) 1992. Biodiversity of the Southeastern United States: Aquatic Communities. John Wiley & Sons, Inc. New York 779 p.

Hauer, F. R. and G. A. Lamberti. 1995. Methods in stream ecology. Academic Press, San Diego. 674 p. (new and much larger edition coming out later this year)

**Hynes, H. B. N. 1970. The Ecology of Running Waters. Univ. Toronto Press, Toronto, 555 pp. An excellent review of older literature – recently reprinted.

Leopold, L. B. 1994. A View of the River. Harvard University Press, Cambridge, MA. 298 p.

Loeb, S.L., and A. Spacie. 1994. Biological Monitoring of Aquatic Systems. Lewis Publishers, Boca Raton 381p.

McAlpine, J.F. et al. 1981. A Manual of Nearctic Diptera. Vol. I, Biosystematics Res. Inst. Agr. Canada Monogr. 27. 674 p.

McAlpine, J.F. et al. 1987. A Manual of Nearctic Diptera. Vol. II, Biosystematics Res. Inst. Agr. Canada Monogr. 28. 675-1332 p.

McCafferty, W. P. 1981. Aquatic Entomology. The fishermen's and ecologists' guide to insects and their relatives. Sci. Books Internat., Boston 448 pp.

Naiman, R. J. & R. E. Bilby. 1998. River Ecology and Management: Lessons from the Pacific Coastal Region. Springer Verlag.

Needham, J.G. and M.J. Westfall, Jr. 1975. A Manual of the Dragonflies of North America (Anisoptera) (reprint of 1954 ed). University of California Press, Berkeley. 615 pp.

**Peckarsky, B.L., P.R. Fraissinet, M.A. Penton, and D.J. Conklin. 1990. Freshwater Macroinvertebrates of Northeastern North America. Cornell University Press, Ithaca, NY. 442 pp. (primarily keys to genera for Northeastern U.S.).

Pennak, R. 1978. Freshwater Invertebrates of the United States. John Wiley and Son, New York, N. Y.

**Resh, V. H. and D. M. Rosenberg (eds.). 1984. The Ecology of Aquatic Insects. Praeger Scientific Publ. Co. New York, N. Y. 625 pp. (no longer available in paperback - I have placed on reserve in Science Library)

Rosenberg, D.M., and V.H. Resh (eds.). 1993. Freshwater biomonitoring and benthic macroinvertebrates. Chapman & Hall, New York. 488 p.

**Stewart, K.W. and B.P. Stark. 2002. Nymphs of North American Stonefly Genera (Plecoptera) (2nd Ed.). The Caddis Press, Columbus, Ohio. 510 pp.

Thorp, J.H. and A.P. Covich. 1991. Ecology and Classification of North American Freshwater Invertebrates. Academic Press, San Diego. 911 p.

Usinger, R. L. (ed.) 1956. Aquatic Insects of California. Univ. Calif. Press, Berkeley. Now an old "Classic" - keys are out of date (the way I learned the families and genera!)

Voshell, J. R. 2002. A Guide to Common Freshwater Invertebrates of North America. McDonald & Woodward Pub. Co. ISBN 0939923874.

Ward, J.V. 1992. Aquatic Insect Ecology. Vol. 1. Wiley, New York

Wetzel, R. G. 2001. Limnology: Lake and River Ecosystems. 3rd edition. Academic Press, San Diego, 1006 p.

Wiederholm, T. (ed.) 1983, 1986, 1989. Chironomidae of the Holarctic Region: Keys and Diagonsis. Pt. 1 Larvae, Pt. 2 Pupae, and Pt. 3 Adults. Published by Entomologia Scandinavica (Suppl. 19, Suppl. 28, and Suppl. 34 and fairly expensive), P.O. Box 24, S-240 17, S. Sandby, Sweden.

**Wiggins, G.B. 1977. Larvae of the North American Caddisfly Genera (Trichoptera). Univ. Toronto Press, Toronto. 401 pp. (note:2nd edition now available) Wiggins, G. B. 1996. Larvae of the North American Caddisfly Genera (Trichoptera), 2nd ed. Univ. Toronto Press, Toronto. 457 pp.

**Williams, D.D., and B.W. Feltmate. 1992. Aquatic Insects. CAB International Press, Wallinford, U.K. 358 p.

Wotton, R.S. 1994. The Biology of Particles in Aquatic Systems. 2nd Ed. Lewis Publishers, Boca Raton. 325 p. (despite name there's considerable ecology in this book).

In addition to these references and since this course open to graduate students only, I would like for us to consider reading some relatively recent (last 6-7 years or so) primary literature dealing directly with aquatic insects, their habitats, biotic and abiotic influences on distribution, behavior, and their role in aquatic ecosystems. Depending on the interest of the class we may consider a day of two of classroom discussions devoted to discussions of several selected research papers during the quarter.

**Grades will be based on the following**:

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| 2 lecture exams @ 25% each (includes final exam) | = 50% |
| 2 laboratory practicals @ 12.5% each | = 25% |
| 1 short research paper and oral class report | = 7% |
| your lab collection | = 18% |

**Collection Requirements:** 10 orders of Aquatic Insects, 70 Genera in at least 40 different Families; These must be from at least 5 different habitats; i.e. streams, ponds, temporary habitats (such as artificial containers), sewage lagoons (?), treeholes, seeps, macrophytes, etc. You should have at least a few adults in your collection, however, no more than 5% of this total may be adults.

With your collection, you should have one label in each vial, with order, family and/or genus. Location, date, and habitat where specimen(s) was collected. On top of each vial, number in sequence by order, and a separate sheet of paper must be submitted with your collection listing order, family and genus. If you used a source other than Merritt and Cummins for your identification, list that source. This list is very important since it will be used in grading your collection. A fine lead pencil, e.g. 0.5 mm or less, is fine for writing these labels.

We will furnish vials for your collection.