

EEB 474: Ichthyology, Fall 2017
Monday and Wednesday, 9:05 – 9:55 am, EPS 400

Instructor: Benjamin P. Keck, PhD
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974-8828

Office hours: 1:00 – 2:00 pm Monday and by appointment made through email. It's best to start with an email including a few days/times you would be able to meet, and I will respond as quickly as I can. When you email, put EEB474 in the subject line and provide me with enough information to answer any questions.

Labs: Hesler Biology Building 603

Mon. and Wed. 10:10 am – 1:10 pm **OR** Tue. and Thu. 9:40 am – 12:25 pm

TAs **Sam Borstein** sborstei@vols.utk.edu and **Joel Corush** jcorush@vols.utk.edu

Course website: You will find the EEB 474 tab on your Canvas page. I recommend that you check Canvas frequently for new announcements, schedule changes, and assignments.

Course description: 4 Credit Hours. Evolution, classification, collection, identification, distribution, and biology of fishes with emphasis on freshwater fauna of eastern North America. 2 hours and 2 labs.

Course Learning Objectives: Understand the basic biology of fish, their evolutionary history, and how to identify fishes from around the world, with a concentration on Tennessee fishes.

Broader Learning Objectives: The focus of this course is fishes, but many of the concepts we cover will be placed into a broader scientific context, including: 1) Evolution from origins in deep evolutionary time to recent ecological time-scales, 2) Functional morphology and environmental niche, 3) Interpreting patterns of gene flow and genetic methods, 4) Feeding strategies, and 5) ecological roles and influences on human culture.

Required Books:

Etnier, D.A. and W.C. Starnes. 2001. *The Fishes of Tennessee*. University of Tennessee Press, Knoxville, TN. ISBN: 0870497111. Available for free: http://trace.tennessee.edu/utk_utpress/2/

Balcombe, J. 2017. *What a Fish Knows: The Inner Lives of Our Underwater Cousins*. Scientific American, New York, NY. 304 pp. ISBN: 0374537097

Suggested Books:

Page, L.M. and B.M. Burr. 2011. *Peterson Field Guide to Freshwater Fishes*. 2nd Edition. Houghton, Mifflin, Harcourt, Boston. ISBN: 0547242064

Kells, V.A. and K. Carpenter. 2011. *A Field Guide to Coastal Fishes: From Main to Texas*. Johns Hopkins University Press, Baltimore. ISBN: 0801898382

Helfman, G. S., B. B. Collette, D. E. Facey, and B. W. Bowen 2009. *The Diversity of Fishes*. John Wiley & Sons, Hoboken. ISBN: 1405124942

Readings: There will be various readings for lectures throughout the term. These will be announced on Canvas and/or in class.

Field Trips: There will be a day trip to Little River during lab time the 6th and 7th of September. There may be an optional trip to Florida over Fall Break, leaving at 5:00 PM on Wednesday the 4th of October and returning evening on Saturday the 7th of October: limited to 17 students with a fee of approximately \$100.

Technology: You may use electronic devices in class for topical applications. Off topic use of these devices is not permitted and will result in that device living next to the podium for the remainder of class. **During exams and quizzes any electronic device seen on your desk or within sight will result in a grade of zero.**

Assessment: I will use the standard UT grading scale without minuses. Grades maybe adjusted upward dependent on student participation and involvement. There will be no individual extra credit, only opportunities for the entire class are a possibility. Any excuse or concern for absence or tardy work should be discussed in a timely manner. There is a total of 800 points available during the course: 400 in Lecture and 400 in Lab.

Lecture Book Chapter:	20	Lab Practical 1:	50
Lecture In Class Group Questions:	80	Lab Practical 2:	50
Lecture term paper:	100	Lab Practical 3:	80
Lecture Mid-term:	100	Lab Practical 4:	80
Lecture Final:	<u>100</u>	Lab Practical 5:	100
Lecture total:	400	Quizzes and Assignments:	<u>40</u>
		Lab total:	400

Book Chapter: In groups of two or three you will provide a summary of a chapter in **What a Fish Knows** at the beginning of lecture. If you will be using Powerpoint, I need to receive a Powerpoint file no later than 8 PM the day before you will be presenting. The summary should be put into a broader context of topics from class.

In Class Group Questions: There will be two group learning exercises during the term worth 40 points each; date below. If you are absent this day you will need a valid excuse to complete a make-up assignment. Everyone in the group receives the same grade. This will be a discussion-based, problem solving exercise and will be very similar to an exam question.

Term Paper: The conservation and restoration of commercial and recreational fisheries along with non-game fishes now has a fairly long history, many spanning multiple decades. For your term paper, you will provide a narrative of a restoration or conservation effort of a North American fish, method such as dam removal, or of a river system. This history should include the cause of the decline, legal process involved (if any), restoration/conservation efforts, and current or final outcomes. There are several parts to this, including: Choosing the system and providing a title with main question or goal described in a few sentences (10 pts), five citations (10 pts), outline (10 pts), and paper (70 pts).

Schedule (subject to change):

Week 1: 23 August

Lecture 1: Introduction to ichthyology

Week 2: 28 and 30 August

Lecture 2: Collection and curation of fishes/global diversity/nomenclature

Lecture 3: Basic fish anatomy and habitat

Week 3: 4 and 6 September

Labor Day

Lecture 4: Genetics revolution and phylogenetics of fishes **Paper Topic Due**

Week 4: 11 and 14 September

Lecture 5: Agnathans

Lecture 6: Feeding and evolution of jaws

Week 5: 18 and 20 September

Lecture 7: Chondrichthyes 1

Lecture 8: Chondrichthyes 2

Week 6: 25 and 27 September

Lecture 9: Chondrichthyes 3 **Citations Due**

Lecture 10: Chondrichthyes 4

Week 7: 2 and 4 October

Lecture 11: Sarcopterygii and tetrapod evolution

Lecture 12: Amia, Polypterus, and friends, and the evolution of lungs **Outline Due**

Fall Break Trip to Florida: 5:00 PM Wednesday the 4th of Oct. to the 7th of Oct.

Week 8: 9 and 11 October

Lecture 13: Osteoglossiformes and Speciation 1

Lecture 14: Clupeiformes to Gonorhynchiformes

Week 9: 16 and 18 October

Mid-Term

Lecture 15: **Group Activity 1**

Week 10: 23 and 25 October

Lecture 16: Cypriniformes and Life History/Developmental Strategies

Lecture 17: Cypriniformes to Gymnotiforms and Convergent Evolution

Week 11: 30 October and 1 November

Lecture 18: Characiformes and Biogeography 1

Lecture 19: Cichlids/Borstein

Week 12: 6 and 8 November

Lecture 20: Siluriformes & Protacanthopterygii 1

Lecture 21: Protacanthopterygii 2 and Osmoregulation

Week 13: 13 and 15 November

Lecture 22: Acanthomorpha and phenotypic novelty

Lecture 23: Acanthopterygii 1

Week 14: 20 and 22 November

Lecture 24: Acanthopterygii 2, Speciation 2, and Hybridization

No Class

Week 15: 27 and 29 November

Lecture 25: **Group Activity 2**

Lecture 26: Acanthopterygii 3 and Biogeography 2 **Term Paper Due**

Week 16: 4 December

Lecture 27: Acanthopterygii 4 and Rare Fishes

Final Exam:

Monday, 11th Dec., 8 AM, normal classroom

Academic integrity:

Academic dishonesty of any sort will not be tolerated. Plagiarism includes the copying of phrases, portions of sentences or the main ideas from ANYONE (including a classmate) on ANY work submitted for a grade (exams, assignments, quizzes, etc). Academic dishonesty also includes assisting other students on quizzes or exams.

You are expected to abide by The University of Tennessee honor statement in Biology and in all of your university activities as pledged in the honor code:

“An essential feature of the University of Tennessee, Knoxville, is a commitment to maintaining an atmosphere of intellectual integrity and academic honesty. As a student of the University, I pledge that I will neither knowingly give nor receive any inappropriate assistance in academic work, thus affirming my own personal commitment to honor and integrity.”

(Undergraduate Catalog)

Depending on the offence, penalties for academic dishonesty range from a minimum of a zero for the assignment, to an F for the course, to the filing of formal academic dishonesty charges seeking dismissal from The University of Tennessee. These choices are at the discretion of the instructor, and can occur in either the lecture or the lab portion of the class.

You should be familiar with the requisites of academic honesty and what constitutes academic dishonesty as outlined in the UT Undergraduate Catalog (<http://catalog.utk.edu/>).

Other information

University Civility Statement:

Civility is genuine respect and regard for others: politeness, consideration, tact, good manners, graciousness, cordiality, affability, amiability and courteousness. Civility enhances academic freedom and integrity, and is a prerequisite to the free exchange of ideas and knowledge in the learning community. Our community consists of students, faculty, staff, alumni, and campus visitors. Community members affect each other's well-being and have a shared interest in creating and sustaining an environment where all community members and their points of view are valued and respected. Affirming the value of each member of the university community, the campus asks that all its members adhere to the principles of civility and community adopted by the campus:

<http://civility.utk.edu/>.

Disability Services:

“Any student who feels s/he may need an accommodation based on the impact of a disability should contact Student Disability Services in Dunford Hall, at 865-974-6087, or by video relay at, 865-622-6566, to coordinate reasonable academic accommodations.

Academic Assistance:

Tutoring: The Division of Biology does not offer tutoring services. Contact the Student Success Center and the Academic Support Unit of The Office of Minority Student Affairs for information about tutoring opportunities.

- **Student Success Center:** The comprehensive source for information, services, and resources to assist your success at UT: <http://studentsuccess.utk.edu>
 - 812 Volunteer Boulevard, Greve Hall, room 324
 - 865 974-6641, Email: studentsuccess@utk.edu

Technical Assistance:

Canvas, clickers, or general information technology assistance:

- Help Desk: 865 974 9900 (M – F, 8:00 – 5:00) or online at <http://help.utk.edu/>
- OIT Walk-In Help Desk: Commons, 2nd floor Hodges Library
- Turning Technologies (clickers): 866 746 3015

Student Health Center: <http://studenthealth.utk.edu/>

1800 Volunteer Boulevard

865 974-3648

Counseling Center: <http://counselingcenter.utk.edu/>

1800 Volunteer Boulevard

865 974-2196, Email: counselingcenter@utk.edu

OTHER RESOURCES FOR STUDENTS:

- One Stop: <http://onestop.utk.edu> (start here for any question you have)
- Undergraduate Catalog: <http://catalog.utk.edu> (Listing of academic programs, courses, and policies)
- Hilltopics: <http://dos.utk.edu/hilltopics> (Campus and academic policies, procedures and standards of conduct)
- Course Timetable: https://bannersb.utk.edu/kbanpr/bwckschd.p_disp_dyn_sched (Schedule of classes)
- Library: <http://www.lib.utk.edu> (Access to library resources, databases, course reserves, and services)
- Career Services: <http://career.utk.edu> (Career counseling and resources; HIRE-A-VOL job search system)
- Academic planning: <http://advising.utk.edu>

Biology Degree Learning Objectives

Students seeking a degree in Biological Sciences (whether the concentration is in Biochemistry, Cellular, and Molecular Biology, Ecology and Evolutionary Biology, or Microbiology) are expected to be able to do the following* by the time they graduate:

You should be able to explain the *five big ideas (FBIs)* in biology, and relate and link these ideas to biological phenomena.

1. **Evolution:** Populations of organisms and their cellular components have changed over time through both selective and non-selective evolutionary processes.
2. **Structure and Function:** All living systems (organisms, ecosystems, etc.) are made of structural components whose arrangement determines the function of the systems.
3. **Information Flow and Storage:** Information (DNA, for example) and signals are used and exchanged within and among organisms to direct their functioning.
4. **Transformations of Energy and Matter:** All living things acquire, use, and release and cycle matter and energy for cellular / organismal functioning.
5. **Systems:** Living systems are interconnected, and they interact and influence each other on multiple levels.

These biological concepts are more fully explained in the AAAS / NSF report "Vision and Change in Undergraduate Biology Education" (visionandchange.org)

You should also be proficient in the following **scientific practices:**

1. Develop hypotheses and predictions (ask scientific questions) based on models or data
2. Interpret scientific representations, such as graphs, phylogenies, or molecular structures, or data, and come to a conclusion (with evidence)
3. Summarize and/or synthesize scientific information verbally or in writing to an audience

*** Student ability to achieve these learning objectives will be tested periodically as part of their departmental requirements.**