

**EEB 474: Ichthyology, Fall 2022**  
**Monday and Wednesday, 9:10 – 10:00 AM, NEB 400**

**Instructor:** Benjamin P. Keck, PhD      he, him, his      bkeck@utk.edu  
203 Strong Hall      974-8828

**Office hours:** 203 Strong Hall 2:00 – 3:00 pm Monday, before or after labs, and by appointment made through email. It's best to start with an email 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  
MW (Becca Smith) 10:30 am – 1:30 pm **OR** TR (Lauren Lyon) 9:50 am – 12:35 pm

**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. Why are fishes so diverse? We will use the fish tree of life as a guide to explore evolutionary and ecological patterns, including anthropogenic, influencing the diversity of fishes. After an introduction to how we describe and classify fishes, we will focus on identifying the notable characteristics and geographic distributions of major lineages, the evolutionary mechanisms responsible, and how those can inform our broader understanding of evolution and ecology. We include the diversity of fishes worldwide, with an emphasis on fishes from eastern North America.

**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/](http://trace.tennessee.edu/utk_utpress/2/)

Miller, M. 2019. **Fishing Through the Apocalypse: An Angler's Adventures in the 21<sup>st</sup> Century.** Lyons Press. 240 pp. ISBN 1493037412

**Suggested Books:**

Page, L.M. and B.M. Burr. 2011. **Peterson Field Guide to Freshwater Fishes.** 2<sup>nd</sup> 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 7<sup>th</sup> and 8<sup>th</sup> of September. There may be an optional Fall Break trip to Florida or Lake Erie and these will be discussed in class.

**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. Grades may be 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
Lecture In Class Group Questions:	80
Lecture term paper:	100
Lecture Mid-term:	100
Lecture Final:	100
Lab Total:	400
<b>Course Total</b>	<b>800</b>

#### Grading Scale by percentage

93 – 100 = A	90 – 92 = A-	
87 – 89 = B+	83 – 86 = B	80 – 82 = B-
77 – 79 = C+	73 – 76 = C	70 – 72 = C-
67 – 69 = D+	63 – 66 = D	60 – 62 = D-
	≤ 59 = F	

**Book Chapter:** In groups of two or three you will provide a summary of a chapter in **Fishing Through the Apocalypse** 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. I'll be giving an example presentation on the first chapter.

**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: 24 August*

Lecture 1: Introduction and Class Goals

*Week 2: 29 and 31 August*

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

Lecture 3: Morphology and Ecology 1

Week 3: 5 and 7 September

**Labor Day**

Lecture 4: Morphology and Ecology 2

Week 4: 12 and 14 September

Lecture 5: Genetics revolution and phylogenetics of fishes

Lecture 6: Agnathans to Gnathostomes **Paper Topic Due**

Week 5: 19 and 21 September

Lecture 7: Feeding

Lecture 8: Chondrichthyes 1

Week 6: 26 and 28 September

Lecture 9: Chondrichthyes 2 **Citations Due**

Lecture 10: Respiration

Week 7: 3 and 4 October

Lecture 11: Sarcopterygii and Tetrapod Evolution

Lecture 12: Polypteridae to Holostei **Outline Due**

Week 8: 10 and 12 October

Lecture 13: Intro to Teleostei & Elopomorpha

Lecture 14: Osteoglossiformes and Otocephala

Week 9: 17 and 19 October

Lecture 15: Gonorhynchiformes and Life History/Developmental Strategies

Lecture 16: Cypriniformes

Week 10: 24 and 27 October

**Mid-Term**

Lecture 17: Gymnotiformes and Speciation

Week 11: 31 October and 2 November

Lecture 18: Biogeography and Hybridization

Lecture 19: **Group Activity 1**

Week 12: 7 and 10 November

Lecture 20: Characiformes and Siluriformes

Lecture 21: Euteleostei

Week 13: 14 and 16 November

Lecture 22: Acanthomorpha

Lecture 23: Acanthopterygii 1 and Phenotypic Novelty

Week 14: 21 and 23 November

Lecture 24: Diversity of Southeastern Fishes Reflection (out of class) **Term Paper Due**

**Thanksgiving**

Week 15: 28 and 30 November

Lecture 25: **Group Activity 2**

Lecture 26: Acanthopterygii 2

*Week 16: 5 and 7 December*

Lecture 27: Acanthopterygii 3

Lecture 28: Acanthopterygii 4 and Rare Fishes

**Final Exam:**

**Monday, 12<sup>th</sup> Dec., 10:30 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](mailto: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, 2<sup>nd</sup> 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](mailto: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](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](http://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.**