

# ENVIRON/EAS 409/EEB 487 – Ecology of Fishes

Winter 2020

Lecture MWF 10-11; Remote through Canvas and Zoom

**Lab syllabus will be presented in the Lab Section**

**Dr. Karen Alofs** – Instructor

Email: [kmalofs@umich.edu](mailto:kmalofs@umich.edu)

Office – G128 Dana; Working remotely this semester, see Canvas for Zoom meetings

Office hours – Tues 10-11am, Wed 11-12pm

**Scott Jackson** – Graduate Student Instructor

Email: [sajacks@umich.edu](mailto:sajacks@umich.edu)

Office hours – Mon 2-3pm, Tues 2-3pm

**Description:** Fishes have a higher rate of endangerment than all other classes of vertebrates, due the varied and intensive human use of aquatic resources. Ecology of Fishes is a course focusing on the interactions between fishes and their environments. The course broadly covers physiology, life-history, predator-prey interactions and population and community level responses to biotic and abiotic factors in freshwater streams and lakes and marine habitats. We discuss adaptations for survival under different environmental constraints, basic fisheries concepts and concerns and fish conservation. Throughout the semester we consider a series of classic and recent studies which illustrate varied ecological concepts.

**Objectives:** After completing this course, you should be able to:

- Explain the varied adaptations that allow fishes to persist across different environments
- Evaluate empirical evidence supporting theory and concepts across scales of ecological organization
- Propose studies and applications that would support the conservation of fish biodiversity

**Core competencies:**

- Acquiring disciplinary knowledge (e.g., physiology, population, community and ecosystem ecology)
- Understanding coupled social-ecological systems (e.g., fisheries and environmental impacts)
- Asking relevant questions & defining problems (e.g., research design)
- Collecting/analyzing data (e.g., methods and analysis of data)

## **COVID-19 and Ecology of Fishes**

The COVID-19 Pandemic has presented us with strange circumstances and some difficult challenges. We will try to address these in Ecology of Fishes with a combination of flexibility and compassion.

If you are finding it difficult to complete assignments or meet deadlines, please reach out to your instructors (before assignment deadlines). We will do our best to make appropriate accommodations. We have created an anonymous feedback form in Canvas and encourage you to submit questions or concerns through this form if you would rather not communicate directly. *Please join lectures, through Zoom, in live-time if you are able.* Please read our guidance on Zoom Etiquette in Canvas. Lectures will be recorded and posted through Canvas.

## Lecture Schedule

Month	Date	Topic	Diana
January	20	<b>I. INTRO FISH ECOLOGY</b>	
	22	Aquatic Ecosystems	Chpt 1
	25	Morphology and Biology of Fishes	
	27	Diversity of Fishes: <i>Dr. Hernan Lopez-Fernandez, U-M EEB and UMMZ</i>	
	29	Ecomorphology	
February	1	Life History Strategy	Chpt 17
	3	Ecological Niche	Chpt 8
		<b>II. PHYSIOLOGY &amp; BIOENERGETICS</b>	
	5	Balanced Energy Equation and Metabolism	Chpt 2
	8	Growth in the lab and field	Chpt 3 & 5
	10	Factors controlling growth	Chpt 6
	12	Energy Storage & Gonad Growth	
	15	Bioenergetic Models	Chpt 7
	17	<i>Discussion: Applied Bioenergetics Models</i>	
	19	Exam Review	
	22	<u>EXAM 1</u>	
	24	<i>Well-being Break</i>	
		<b>III. POPULATIONS &amp; COMMUNITIES &amp; LANDSCAPES</b>	
	March	26	Density Dependence
1		Density Independence, Critical Period	
3		Competition	Chpt 10
5		Components of Predation – <i>Dr. Kelsey Lucas, UM SEAS Postdoctoral Researcher</i>	Chpt 11
8		Optimal Foraging	Chpt 13
10		Predation and Structure	
12		Foraging and Predation Risk	
15		Movements of Predatory Fishes	Chpt 15
17		Reproductive Behavior and Spawning Migrations	Chpt 16
19		Exam Review	
22		<u>EXAM 2</u>	
		<b>IV. AQUATIC ECOSYSTEMS</b>	
24		The Great Lakes	Chpt 25
26		Fish Communities in Temperate Streams	Chpt 21
29	<i>Discussion: River Food Webs</i>		
31	Tropical Rivers	Chpt 22	
April	2	Fish Communities in Lakes	Chpt 20
	5	Coral Reef Communities	Chpt 23
		<b>V. FISHERIES &amp; CONSERVATION ECOLOGY</b>	
	7	Aquaculture and Fisheries	Chpt 24
	9	Endangerment and Extinction	Chpt 26
	12	<i>Discussion: Multiple Stressors</i>	
	14	Resilience and Ecosystem Services	
	16	Habitat Restoration- <i>Scott Jackson, UM SEAS PhD Student</i>	
	19	Environmental Change Virtual Film Festival	
	28	<u>FINAL EXAM- 1:30-3:30 pm</u>	

## Reading Materials

**Reference Text:** Diana, J.S. 2004. *Biology and Ecology of Fishes*, Second edition. Biological Sciences Press, Carmel, Indiana.

**Supplemental Reading materials** for lecture topics will be provided on Canvas.

**Discussion 1:** Applied Bioenergetics Models, February 7

Cooke, S. L., and W. R. Hill. 2010. Can filter-feeding Asian carp invade the Laurentian Great Lakes? A bioenergetic modelling exercise. *Freshwater Biology* 55:2138–2152.

**Discussion 2:** River Food Webs, March 25

Power, M. E. 1990. Effects of fish in river food webs. *Science* 250:811–814.

Power, M. E., K. Bouma-Gregson, P. Higgins, and S. M. Carlson. 2015. The thirsty Eel: summer and winter flow thresholds that tilt the Eel River of Northwestern California from Salmon-supporting to Cyanobacterially degraded states. *Copeia* 103:200–211.

**Discussion 3:** Multiple Stressors, April 13

Pringle, R. M. 2005. The origins of the Nile Perch in Lake Victoria. *BioScience* 55:780–787.

van Zwieten, P. A. M., J. Kolding, M. J. Plank, R. E. Hecky, T. B. Bridgeman, S. MacIntyre, O. Seehausen, and G. M. Silsbe. 2016. The Nile perch invasion in Lake Victoria: cause or consequence of the haplochromine decline? *Canadian Journal of Fisheries and Aquatic Sciences* 73:622–643.

## Grading

**Two Midterm Exams** - 20 pts each x 2

**One Final Exam** – 30 pts

**5-minute Media Presentation** – 10 pts

**Discussion Reflection for Discussions 1, 2, and 3** –5 pts each x 3, *due 1 week after discussion*

**Participation in Lecture and Discussion** – 5 pts

**Environmental Change Video** – 10 pts

*Grade Assignment:* 93 pts and above A, 90-92 A-, 87-89 B+, 83-86 B, 80-82 B-, 77-79 C+, 73-76 C, 70-74 C-, 67-69 D+, 63-66 D, 60-62 D-, below 60 pts F

*How to get an A+:* The grade of A+ is reserved for exceptional performance and only a few students will receive A+ grades. A+ grades will not be earned on points alone. The instructional team will meet at the end of the term to consider student who have earned A grades, by points, and identify those who have excelled in participation and individual work.

Final grades will be curved up at the instructor's discretion.

Expectations for assignments will be presented in lecture and posted on Canvas.

## Other Considerations

**Participation-** Please engage in lecture, ask questions, contribute your thoughts and respect your classmates. The diversity of our experiences and knowledge strengthens science, our understanding of it, and our ability to explain it to others.

### **Communication**

Course business including announcements, assignments, videos, discussions, and grading will be done through Canvas. Please ensure that you will receive announcements sent through Canvas in a timely manner.

### **Recordings of Class Activity**

Course activities may be audio/video recorded and made available to other students in this course. As part of your participation in this course, you may be recorded. If you do not wish to be recorded, please contact the course GSI the first week of class (or as soon as you enroll in the course, whichever is latest) to discuss alternative arrangements.

**Academic Integrity-** We follow the University of Michigan Policy Statement on Academic Integrity.

**Late Assignments-** Late assignments will lose 10% per day. Please consult your instructor as soon as possible if there are circumstances which will prevent you from completing an assignment on time.

**Regrades-** Other than simple calculation errors, requests to re-consider grading should be submitted to the instructor in writing. In such cases, the instructor reserves the right to regrade the entire assignment or exam.

**Field Course:** <https://lsa.umich.edu/umbs/students/courses/michigan-fishes.html>

### **Michigan Fishes in Changing Environments - EAS 501/ENVIRON 463 (2 Credits)**

As part of the Transforming Learning Program at the University of Michigan Biological Station, and COVID-permitting, we hope to offer a two-week course which will work as an add-on field experience for students that have taken or will take Ecology of Fishes (ENV409/EAS409/EEB487 Winter) or Biology of Fishes (ENV422/EAS422/EEB440 Fall). This course runs two weeks in August, but you will enroll for fall term credit. Michigan fish communities are facing rapidly changing climates, habitat fragmentation and degradation, and increasing species invasions. In this field course, you will learn how to investigate the impacts of these changes. You will learn fish identification, handling, and sampling, habitat description and water quality assessment. In addition, you will also learn field photography, tissue sampling, specimen preservation and data management and analysis methods.

### **Mental Health and Student Well-Being**

Students may experience stressors that can impact both their academic experience and their personal well-being. These may include academic pressure and challenges associated with relationships, mental health, alcohol or other drugs, identities, finances, etc.

If you are experiencing concerns, seeking help is a courageous thing to do for yourself and those who care about you. If the source of your stressors is academic, please contact us so that we can find solutions together. For personal concerns, U-M offers the following resources:

- [Counseling and Psychological Services \(CAPS\)](#) – confidential; 734-764-8312
  - CAPS offers [After-Hours Urgent Support](#) – 734-764-8312 (press “0” to speak to a licensed mental health professional)
- [Dean of Students Office](#) – 734-764-7420, [deanofstudents@umich.edu](mailto:deanofstudents@umich.edu)
- [Services for Students with Disabilities \(SSD\)](#) – 734-763-3000, [ssdoffice@umich.edu](mailto:ssdoffice@umich.edu)
  - accommodations and access to students with disabilities
- [Sexual Assault Prevention and Awareness Center \(SAPAC\)](#) – confidential; 734-764-7771
  - 24 hour crisis line – 734-936-3333
  - addresses sexual assault, intimate partner violence, sexual harassment, and stalking
- [University Health Service \(UHS\)](#) – 734-764-8320, [contactuhs@umich.edu](mailto:contactuhs@umich.edu)
  - UHS provides [nurse advice](#) by phone, day or night – 734-764-8320
- [Well-being Canvas site](#)
  - [Houses comprehensive list of campus resources for well-being](#)
- [Wolverine Wellness](#) – 734-763-1320, [contactuhs@umich.edu](mailto:contactuhs@umich.edu)

- Ginsberg Center for Community Service Learning - 734-763-3548; opportunities to engage as learners and leaders to create a better community and world
- Multi-ethnic Student Affairs (MESA) - 734-763-9044; diversity and social justice through the lens of race and ethnicity
- Office of Student Conflict Resolution - 734-936-6308; offers multiple pathways for resolving conflict
- Office of the Ombuds - 734-763-3545; students can raise questions and concerns about the functioning of the university.
- Spectrum Center - 734-763-4186; support services for LGBTQ+ students
- Trotter Multicultural Center - 734-763-3670; intercultural engagement and inclusive leadership education initiatives

A more comprehensive list of resources can be found here: [tiny.cc/distresssignals](http://tiny.cc/distresssignals)  
 Seeking help is a courageous thing to do for yourself and those who care about you.

### **Accommodations for Students with Disabilities**

Please contact us if you require accommodation to support your learning in this course due to the impact of a disability, visible or non-visible. Solutions that benefit one student can sometimes benefit the class as a whole. If you have already established accommodations with Services for Students with Disabilities (SSD) regarding your needs, please let us know what your required accommodations are at your earliest convenience so we can work together to meet your needs in this course. If you have not yet established accommodations through SSD and you have a temporary or permanent condition that requires accommodation, please contact SSD as soon as possible. Accommodations can vary to meet students' needs, including – but not limited to – those related to attention, hearing, learning, medical, mental health, mobility, or vision.

### **Religious or Cultural Observances and Other Needs**

This class observes university-defined holidays. However, there may be other days of more significance to you than those designated by the university. Please inform us as soon as possible via email if a class day or assignment due date conflicts with your observance of a holiday so that we can work with you to accommodate your needs. If there are any other needs that you have to support your learning in this course, please also bring these to my attention as soon as possible so that we can work together to ensure your success in the course.