Invasion Ecology of Aquatic Animals
FAS 6932 (3 credits) Spring, 2016

Course Description

A comprehensive overview of invasion ecology, highlighting aspects related to aquatic animals, including ecological concepts and debates underlying this developing field; biology and life history of nonnative aquatic animals, including characteristics of successful invaders; risk analysis methodology; and the conservation and regulatory implications of nonnative aquatic species.

Instructor

***Jeffrey E. Hill**, Ph.D.*
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UF/IFAS Tropical Aquaculture Laboratory (TAL)
1408 24th Street SE
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813-671-5230 x118
Office hours: Available by email or phone; office visits available by appointment.
Note that the instructor is located about 2 hrs from main campus and will be most available for discussion in Gainesville before and after class.

Graduate Teaching Assistant

***Katelyn M. Lawson**, Ph.D. Candidate*
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Student Learning Outcomes

At the end of this course, each student will:

- understand the concepts associated with species invasions
- use basic risk assessment methodology
- think critically to evaluate literature and arguments, especially when faced with uncertainty and scientific disagreement
- more effectively communicate orally and in scientific writing

- appreciate for the complex relationship between science, management, and regulation

Course Meeting Times

Tuesday Periods 7-9 (1:55-4:55 pm); MCCD G001

Required Readings

There is no required text for the course. Some important texts that I draw heavily upon for the course are listed as "Additional References," below. Required readings will be provided in Canvas and will include the following papers which must be read by about the date specified below as the discussion thread will be posted that day and will run for one week.

Papers	**Read by:**
Colautti, R.I., and H.J. MacIsaac. 2004. A neutral terminology to define 'invasive' species. Diversity and Distributions 10: 135-141.	Jan 12
Hill, J.E. 2008. Non-native species in aquaculture: terminology, potential impacts, and the invasion process. USDA-Southern Regional Aquaculture Center Publication No. 4303.	Jan 19
Pimentel, D., R. Zuniga, and D. Morrison. 2005. Update on the environmental and economic costs associated with alien-invasive species in the United States. Ecological Economics 52: 273-288.	Feb 9
Gozlan, R.E. 2008. Introduction of non-native freshwater fish: is it all bad? Fish and Fisheries 9: 106-115. Vitule, J.R., C.A. Freire, and D. Simberloff. 2009. Introduction of non-native freshwater fish can certainly be bad. Fish and Fisheries 10: 98-108.	Feb 16
Courtenay, Jr., W.R. 1997. Nonindigenous fishes. Pages 109-122 *in* D.S. Simberloff, D.C. Schmitz, and T.C. Brown, editors. Strangers in Paradise, Island Press. Shafland, P.L. 1996. Exotic fish assessments: an alternative view. Reviews in Fisheries Science 4:123-132.	Feb 23
Hill, J.E. 2002. Exotic fishes in Florida. LakeLines, North American Lake Management Society 22(1):39-43. Trexler, J.C., W.F. Loftus, F. Jordan, J.J. Lorenz, J.H. Chick, and R.M. Kobza. 2000. Empirical assessment of fish introductions in a subtropical wetland: an evaluation of contrasting views. Biological Invasions 2:265-277.	March 8

Hill, J.E. 2009. Risk analysis for non-native species in aquaculture. USDA-Southern Regional Aquaculture Center Publication No. 4304.	March 15
RAM Committee (Risk Assessment and Management Committee). 1996. Generic nonindigenous aquatic organisms risk analysis review process. Aquatic Nuisance Species Task Force. Verbrugge, L.N., G. van der Velde, A.J. Hendriks, H. Verreycken, and R.S. Leuven. 2012. Risk classification of aquatic non-native species: Application of contemporary European assessment protocols in different biogeographical settings. Aquatic Invasions 7: 49-58.	March 22
Vander Zanden, M.J., and J.D. Olden. 2008. A management framework for preventing the secondary spread of aquatic invasive species. Canadian Journal of Fisheries and Aquatic Sciences 65: 1512-1522.	April 5
Jeschke, J. 2014. General Hypotheses in Invasion Ecology. Diversity and Distributions 20:1229-1234. DeRivera, C. E., G.M. Ruiz, A.H. Hines, and P. Jivoff. 2005. Biotic Resistance to Invasion: Native predator limits abundance and distribution of an introduced crab. Ecology 86 (12): 3364-3376.	April 12
Shea, K. and P. Chesson. 2002. Community ecology theory as a framework for biological invasions. Trends in Ecology and Evolution 17: 170-176.	April 19

Additional, supplemental readings will be provided in Canvas. These supplemental readings will be provided for each lecture topic and by invited speakers.

Class Format, Policies on Attendance and Make-up Exams

The course is a classroom-based, lecture and discussion format. For this online version, in-class lectures will be recorded each week and posted to Canvas where you can view them. No specific pre-requisites are required but the class is intended for advanced undergraduates and graduate students. Given the broad scope of the field of invasion ecology, the course will cover diverse topics, each requiring a base of knowledge for the course to build upon. Students should have prior coursework in biology and have an understanding of basic ecological concepts.

Attendance records will not be maintained, but it is the responsibility of the student to maintain satisfactory progress in the course and to make up all work. Late project assignments will be penalized 10% on the first day and 5% on each subsequent day. Missed exams cannot be taken after the scheduled date without prior written consent of the instructor except under exceptional circumstances. Cases of serious illness, bereavement, or activities covered under the Twelve-Day Rule will be considered for make-up. Appropriate documentation must be provided in all cases.

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found at: https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx.

Assignments

Projects **MUST** be submitted in Canvas by the due date and time posted in Canvas. There will be a penalty for late projects. Make prior arrangements and expect to turn projects in early if there are conflicts with the schedule.

- *Species Synopsis* – Students will choose a non-native aquatic species of relevance to Florida and write a brief species synopsis. The species may be freshwater, estuarine, or marine and must be a non-plant taxon. Species will be chosen in consultation with the course instructor to prevent student overlap. A detailed outline of the project requirements will be provided during class and in Canvas. In brief, students will conduct literature and internet searches to obtain information on the occurrence, life history, ecology, effects, and regulatory status of the species and write a fact sheet summarizing this information and pointing out gaps in knowledge.

- *Risk Assessment* – Students will participate in teams to conduct a risk assessment using the Federal Aquatic Nuisance Species Task Force RAM Committee Generic Analysis method or a risk screen using the Fish Invasiveness Screening Kit (FISK or related FISK-like variant) on a select group from the class species synopses. Teams will provide a copy of their completed risk assessment along with a short narrative explaining their methodology and results. More detailed information and requirements will be posted in Canvas.

- *Topic Review/Data Paper*— Graduate students have two options for this assignment—(1) a topic review or (2) a paper based on the analysis of a data set. Topics or data sets must be approved by the instructor. (Option 1) The student will choose an ecological topic pertinent to invasion ecology (e.g., relation of community diversity and invasibility) and write a detailed literature review of the subject. (Option 2) The student will provide a data set pertinent to invasion ecology, analyze the data, and write a short, data-based paper. This project will provide experience in finding and obtaining literature, assimilating and synthesizing technical information, and producing a detailed, written product. More detailed instructions will be provided during class and posted in Canvas.

- *Exams* – There will be two exams (a midterm and final). These will cover all information in lectures, readings, and from invited speakers. Species profiles and risk assessments (except what is covered in lecture), and topic reviews will not be covered on exams. You will have 24 hours after the exam is posted in Canvas to complete and submit it. Exams for online students will be given the same day as the regular class.

Online Discussions

This course includes class discussions of the assigned readings. This forms the basis for the participation grade. For the online version of this course, face-to-face discussions will be replaced with text-based discussion threads in Canvas. The teaching assistant will create, start, and moderate each discussion.

- Discussions will be announced once they are created so check Canvas frequently.
- Each student is required to post a minimum of three comments and/or replies per discussion. Discussions will remain open for one week.
- Two discussion grades will be dropped.

Evaluation of Student Learning

15% Species Synopsis
20% Mid-Term exam
15% Risk assessment
20% Topic review/Data Paper
20% Final exam
10% Discussion participation

Grading Scale

A 94-100%; A- 90-93; B+ 86-89; B 83-85; B- 80-82; C+ 76-79; C 73-75; C- 70-72; D+ 66-69; D 63-65; D- 60-62; E <60%

http://gradcatalog.ufl.edu/content.php?catoid=5&navoid=1054&hl=grades&returnto=search#grades

Schedule of Class Topics

WEEK	DATE	TOPIC	ASSIGNMENTS
1	Jan 5	Introduction/Pathways of Introduction	
2	Jan 12	Biogeography/Invasion Process	
3	Jan 19	Stages of Invasion Process	
4	Jan 26	Invasion Process Theory	**Species Choice Due**
5	Feb 2	Impacts	
6	Feb 9	Impacts	
7	Feb 16	Classic Case Studies	**Species Profiles Due; Review/Data Set Topic Due**
8	Feb23	Florida Case Studies /Review	
9	Mar 1	**Spring Break—No Class**	
10	Mar 8	Risk Analysis/Risk Assessment	**Mid-Term Exam**
11	March 15	Risk Assessment	
12	March 22	Risk Assessment Case Studies	
13	March 29	International, Federal, and State Management and Policy	**Risk Assessment Presentation**
14	April 5	Management Techniques/Case Studies	
15	April 12	Ecological Theory	
16	April 19	Ecological Theory/Review	**Topic Reviews or Data Papers Due**
	April 28		**Final Exam (Thursday 3-5 pm)**

Additional References

Davis, M.A. 2009. Invasion Biology. Oxford University Press.

Elton, C.E. 1958. The Ecology of Invasions by Animals and Plants. Revised edition (2000). The University of Chicago Press.

Lockwood, J.L., M.F. Hoopes, and M.P. Marchetti. 2007. Invasion Ecology. Blackwell Publishing.

Williamson, M. 1996. Biological Invasions. Chapman & Hall.

Online Evaluation

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at https://evaluations.ufl.edu. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results/.

Other Information

Honor Pledge

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Software Use

All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

Campus Helping Resources

- Contact information for the Counseling and Wellness Center: http://www.counseling.ufl.edu/cwc/Default.aspx, 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

- Career Resource Center, First Floor JWRU, 392-1601, **www.crc.ufl.edu/**

Students with Disabilities

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, www.dso.ufl.edu/drc/) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

E-learning Help Desk

If students encounter technology issues with the course site, please access the online help desk available at: https://wiki.helpdesk.ufl.edu/FAQs/E-Learning. If there are no available resources to help you resolve the problem, there is contact information posted so you can ask staff members for assistance.