

FAS6339C

Advanced Quantitative Fisheries Assessment

Course Description:

Advanced Quantitative Fisheries Assessment is a graduate course offered by Fisheries and Aquatic Science covering topics related to population modeling, fisheries stock assessment, and management. This course will focus on modern stock assessment models, computational techniques, why these methods work, why they sometimes fail, and how they can be improved and used in evaluating management decisions. The aim of this course is to provide students with concepts, methods, and tools needed to work effectively on common problems in applied ecology and fisheries assessment. These problems range from the analysis of fish habitat or population status as they relate to conservation, environmental management, and ecosystem assessment needed for sustainable harvest management.

Credits: 4 Semester: Spring 2024, Fall 2025+ Format: Online, asynchronous

Instructor:

Dr. Zachary (Zach) Siders
Fisheries and Aquatic Sciences
School of Forest, Fisheries, and Geomatics Sciences
email: zsiders@ufl.edu
Main: 352-273-3644
Office: Dequine Bldg. 103, Millhopper Campus

Contact instructions: Please use Canvas messaging for the fastest response (note that Canvas only sends attachments from the web portal)

Office Hours: By appointment and virtually on Fridays, 11am-12pm

Prerequisites: FAS 6337C Fish Population Dynamics

Recommended Reading List:

There is no required reading for the class. Much of the backbone of the class will draw from:

Walters, C.J., and S.J.D. Martell. 2004. Fisheries management and ecology. Princeton University Press, Princeton, New Jersey.

Additional readings will be provided to accompany lectures and quantitative sessions aimed to have readings covering: 1) methodology applied in quantitative sessions; 2) conceptual overview/review of methodology; 3) methodological extension.

Learning outcomes:

By the end of the course, students should be able to demonstrate an understanding of the following concepts and techniques:

- Identify potential problems with datasets
- Identifying the appropriate state dynamics model, observation model, and statistical methods for evaluating population or ecosystem attributes of interest

- Using maximum likelihood and Bayesian methods for evaluating model credibility and parameter uncertainty
- Familiarity with advanced analytical tools for assessing ecological and fisheries datasets
- Capturing spatial processes using spatially explicit and spatially implicit techniques.
- Forecasting and evaluating risk of management options
- Developing computer code to perform these evaluations and present the results in an appropriate manner

Course logistics:

Students may access lectures, quantitative sessions, assignments, readings, supporting material, and group activities through the course Canvas site as they become available.

Technology requirements:

- A computer or mobile device with high-speed internet connection.
- A webcam, headset and/or microphone, and speakers.
- Latest version of web browser. Canvas supports only the two most recent versions of any given browser.
- Installation of proctoring software may be required and will be provided if so.

Synchronous online sessions may be recorded. By sharing your video, screen, or audio during any synchronous online class sessions, you are consenting to being recorded for the benefit of students who cannot attend live as well as for class review during the current semester. If you have special circumstances or concerns about privacy, it is your responsibility to discuss it with your instructor.

Course structure:

Each week of the course will consist of a lecture on relevant ecological and fisheries science concepts, a lecture on relevant quantitative or statistical concepts, and a quantitative analysis session (lab). The quantitative analysis session will reinforce and strengthen concepts learned in class through hands-on activities. These course components will be pre-recorded and available on the Canvas site. Accompanying weekly readings will be posted on the Canvas site as well. We will also meet weekly synchronously to discuss course concepts, answer questions. Students should also be meeting with their groups frequently (weekly, bi-weekly).

Course learning content:

1. Why and how we manage populations and stocks?
 - 1.1. Develop an understanding of the role that population/fisheries assessment plays in the management of harvested populations.
 - 1.2. Understand the strategies and tactics that are appropriate to meet management objectives.
2. What are the fundamental biological and ecological principles that allow for sustainable harvest?
 - 2.1. Develop an understanding of density-dependent processes and how these processes are represented in mathematical models.
3. What information can be extracted from specific data sources and what assumptions must be made to extract certain information from specific data sources?
 - 3.1. Develop an understanding of how specific population-level phenomenon appear in data streams.
4. What are the underlying biological principles and statistical challenges related to developing relationships and parameters used in assessments?
 - 4.1. Develop an understanding of the statistical challenges faced when developing recruitment curves.
 - 4.2. Understand how natural mortality can be estimated.
 - 4.3. Understand the approaches to standardizing fisheries data
5. What are the fundamental approaches to estimating natural population abundance?
 - 5.1. Learn to identify when specific methods are appropriate for estimating population abundance.
 - 5.2. Learn to identify what abundance estimation methods are generally used in stock assessment.
6. What are common parametric distributions and model structures used to represent different data types?
 - 6.1. Develop an understanding of different statistical distributions
 - 6.2. Learn when to use different statistical distributions
 - 6.3. Develop an understanding of random effects, zero-inflation, and structured random effects

Evaluation and performance criteria:

Your grade will be composed of three components: group assignments, mock SSC presentation, and an individual project.

Component	Number	Part-worth	Total
Group Assignments	3	20%	60%
Mock SSC presentation	1	15%	15%
Individual Project	1	25%	25%

Group Assignments: Each student will be assigned to a group with a corresponding dataset. You will meet regularly with your group to work on a total of three assignments throughout the course. These three assignments will roughly correspond to the three main sections of the course: data inputs, basic assessment, composition-structured assessments. Groups will work together to conduct a relevant analysis on their assigned stock and matching dataset and compile that analysis into a report on their findings. Reports should thoroughly address any steps needed to conduct the analysis including: data cleaning, choice of model, key assumptions, trials exploring model structure, results, and where additional analysis could go. Merely replicating an analysis presented in the quantitative sessions will not earn full credit. Groups must work together to explore and tinker their model structures to receive full credit, e.g. testing key assumptions by parameter sensitivity analysis, comparing variations on a model's structure, or comparing inference approaches.

Mock SSC presentation: Each group will present a 20-minute presentation about the status of their assigned stock given the provided data in a mock Science and Statistical Committee presentation. This scientific review panel is a key feature of the stock assessment process in the United States. Students will serve alongside panel experts as mock SSC members when it is not their turn to present. Each group's presentation needs to be split evenly among group members, must be informed by their dataset and analyses in the group assignments, and cover the basics of their stock, the dynamics of the fishery exploiting the stock, and their stock status. Students will be graded on the quality and thoroughness of their presentation as well as how they respond to constructive feedback from the panel.

Individual project: Each student will need to work throughout the semester on a final project that is due the last week of class (before final's week). The individual project should mirror the group assignments in thoroughness and intensity but conducted on their own datasets (preferably in support of degree-seeking research activities). Should a student find themselves without an appropriate dataset, they should notify the instructor by end of the first month of classes to be provided one. Strategic students will attempt to replicate the quantitative session analyses on their own datasets as the class

progresses so the individual project can draw heavily on a solid foundation of completed analyses.

Grading Policy: Please see the [UF grading policy](#) for the assignment of letter grades and GPA.

Late work and absences: Assignments turned in by 11:59 pm on the due date are considered on time. After that, late assignments will lose value at the rate of 10% for the first late day and 5% for each subsequent late day. Arrangements to turn in assignments late due to conflicts must be made prior to the assignment due date.

Downloads

For this course you will need several applications. We will work through these in class but please download these applications to your laptop.

1. [R and the following packages:](#)
 - a. TMB
 - b. glmmTMB
 - c. sdmTMB
 - d. cmdstanr
 - e. brms
2. (Optional) [SublimeText](#)
 - a. SublimeText is a free text editor with a lot of functionality for coding in a variety of languages including in R. I personally use SublimeText as my default editor for 95% of my programming.

Policies and Requirements:

This course plan and syllabus are subject to change in response to student and instructor needs. Any changes will be clearly communicated in advance through Canvas.

Attendance, Late Submissions & Make-up Requests: It is the responsibility of the student to access on-line lectures, readings, and assignments and to maintain satisfactory progress in the course. Students are expected to attend all weekly discussions. Requirements for class attendance and make-up assignments and other work are consistent with university policies that can be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

Students who need accommodations for late or missed assignments are expected to request accommodations in a timely manner from the instructor.

Computer or other hardware failures, except failure of the UF e-Learning system, will not excuse students for missing assignments. Any late submissions due to technical issues **MUST** be accompanied by the ticket number received from the Helpdesk when the problem was reported to them. The ticket number will document the time and date of the problem. You **MUST** e-mail your instructor within 24 hours of the technical difficulty if you wish to request consideration. For computer, software compatibility, or access problems call the HELP DESK phone number—352-392- HELP = 352- 392-4357 (option 2).

Communication Courtesy and Professionalism: Just as in any professional environment, meaningful and constructive dialogue is expected in this class and requires a degree of mutual respect, willingness to listen, and tolerance of opposing points of view. Respect for individual differences and alternative viewpoints will be maintained in this class at all times. All members of the class are expected to follow rules of common courtesy, decency, and civility in all interactions. Failure to do so will not be tolerated and may result in loss of participation points and/or referral to the Dean of Students' Office.

Semester Evaluation Process: Student assessment of instruction is an important part of efforts to improve teaching and learning. At approximately the mid-point of the semester, the School of Forest, Fisheries, & Geomatics Sciences will request anonymous feedback on student satisfaction on various aspects of this course. These surveys will be sent out through Canvas and are not required but encouraged. This is not the UF Faculty Evaluation! At the end of the semester, students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via

<https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

Academic Honesty Policy: As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.” You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit 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." It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct or appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated.

Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: <http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code>.

Inclusive Learning Environment: This course embraces the University of Florida’s Non-Discrimination Policy, which reads, The University shall actively promote equal opportunity policies and practices conforming to laws against discrimination. The University is committed to non-discrimination with respect to race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information and veteran status as protected under the Vietnam Era Veterans’ Readjustment Assistance Act.

If you have questions or concerns about your rights and responsibilities for inclusive learning environment, please see the instructor or refer to the Office of Multicultural & Diversity Affairs website: <http://multicultural.ufl.edu>.

Services for Students with Disabilities: The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation. 0001 Reid Hall, 352-392-8565, disability.ufl.edu

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:

For issues with technical difficulties for e-learning in Canvas, please post your question to the Technical Help Discussion in your course, or contact the UF Help Desk at:

- Learning-support@ufl.edu | (352) 392-HELP - select option 2 | <http://elearning.ufl.edu>
- Library Help Desk support <http://cms.uflib.ufl.edu/ask>
- SFFGS Academic Hub <https://ufl.instructure.com/courses/303721>

Student Life, Wellness, and Counseling Help: Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

- Counseling and Wellness resources <http://www.counseling.ufl.edu/cwc/>
- U Matter, We Care <http://www.umatter.ufl.edu/>
- Career Connections Center <http://career.ufl.edu/>
- Other resources are available at <http://www.distance.ufl.edu/getting-help> for online students.

Student Complaint Process: The School of Forest, Fisheries, & Geomatics Sciences cares about your experience and we will make every effort to address course concerns. We request that our online students complete a course satisfaction survey each semester, which is a time for you to voice your thoughts on how your course is being delivered. You can also submit feedback anytime.

If you have a more urgent concern, your first point of contact should be the Academic Coordinator or the Graduate/Undergraduate Coordinator for the program offering the course. You may also submit a complaint directly to UF administration:

- <https://distance.ufl.edu/getting-help/>
- <https://registrar.ufl.edu/complaint.html>