

## FAS - 6337C Fish Population Dynamics – Fall 2013

**Credits:** 4 hours

**Course Description:** Course will demonstrate the analysis of fish population data for management purposes. Methods for estimating fish population parameters (e.g., growth, recruitment, and mortality) will be conducted. You will predict yield and catch composition for recreational and commercial fisheries, and assess effects of harvest restrictions for fisheries management problems. This course is intended for graduate students in SFRC or other natural-resource departments. We will use R and Microsoft Excel in the course.

**Objectives and Learning Outcomes:** Your objective is to become proficient with tools to conduct basic assessments for recreational and commercial fisheries. Lectures will demonstrate the methods used, and laboratories will provide experience in using the various assessment tools.

- At the end of this course you should be proficient in basic parameter estimation and stock assessment of fish populations.
- You will have experience in data analysis and interpretation, and its use for management
- You should be able to analyze data and interpret the results to diagnose overfishing and explore how management policies can improve fisheries.

**Instructors:**

Dr. Mike S. Allen

Fisheries and Aquatic Sciences

School of Forest Resources and Conservation

email: [msal@ufl.edu](mailto:msal@ufl.edu)

Web Page: <http://allenlab.ifas.ufl.edu/courses.html>

Sakai web site, access through: <https://lss.at.ufl.edu/>

Office phone 352-273-3624, cell 258-3454

Teaching Assistant: Stephanie Shaw [sshaw@ufl.edu](mailto:sshaw@ufl.edu)

**Lecture Times:** Video for lectures and labs are available at:

**Class Location and Time: NZ 222**

Tuesdays 7:25-9:20 AM

Thursdays 8:30-9:20, and 10:40-12:35

## References

Anderson

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

Haddon, M. 2000. Modelling and Quantitative Methods in Fisheries. Chapman and Hall, London. ISBN 1-58488-177-1

Ricker, W. E. 1975. Computation and interpretation of biological statistics of fish populations. Bulletin 191 of the Fisheries Research Board of Canada.

## Grading System:

Laboratory exercises	9 @ 5% each	45%
Midterm Exam		20%
Draft Manuscript		35%
Total		100%

<b>Letter</b>																		S-
<b>Grade</b>	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E	WF	I	NG	U		
<b>Grade</b>																		
<b>Points</b>	4	3.7	3.3	3	2.7	2.3	2	1.7	1.3	1	0.7	0	0	0	0	0	0	

Exams will consist of short-answer questions, definitions, and statistical and mathematical problems.

Turn in all materials on Sakai, please do not use email for assignments!

# FAS -6337C Fish Population Dynamics

## Lecture Syllabus

### I. Introductory Material

- course goals
- what is a fishery?
- history of fisheries management
- what is a model?

### II. Population Growth

- rates of increase (finite versus instantaneous)
- derivation
- models

### III. Somatic growth

- age-and-growth estimation techniques
- reporting fish growth
- models of fish length and weight
- condition indices
- comparison of growth rates using linear and nonlinear methods

### IV. Mortality

- finite and instantaneous rates
- fishing and natural mortality expression
- conditional mortality rates
- compensatory versus additive mortality
- estimation techniques and confidence intervals

### V. Recruitment

- definitions
- estimation
- stock-recruitment relationships
- environmental factors
- stochastic methods

### VI. Population Models

- equilibrium yield model
- incorporating variation in models
- use and misuse of stochastic models

### VII. Fish Population Trends

- cycles in fish populations
- effects of density
- abiotic versus biotic influences on abundance

-effects

VIII. Models based on Catch-at-Age  
-Virtual Population Analysis  
-Statistical Catch-at-Age model

X. Review and Concluding Topics

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## Laboratory Syllabus

Data for all labs can be obtained from the web page or Sakai page. Each laboratory will include a lab report that includes:

1. Your data analysis, including your R program and/or Excel sheet, and
2. Short answers to questions presented for each lab exercise.

### Schedule

<u>DATE</u>	<u>TOPIC</u>
Aug 22	Lab overview, introduction to likelihood methods and R
Aug 29	Assessment of fish size structure in R (assignment #1)
Sep 5	<b>No Class, Mike National AFS Meeting</b>
Sep 12	Estimates of fish growth, fitting growth models in R, spotted seatrout (assignment 2, part 1)
Sep 19	Continue growth analysis AIC comparison of model parameters (assignment 2, part 2)
Sep 26	Total mortality estimation and comparison with ANCOVA in R, black crappie (assignment #3)
Oct 3	Estimating size at maturity and comparison of curves, white grunt (assignment #4)
Oct 10	Fitting stock-recruitment curves, black crappie and walleye (assignment #5)
Oct 17	Equilibrium yield per recruit model (assignment #6)
Oct 24	Stochastic age structured model with biological reference points, spotted seatrout (assignment 7, part 1)
Oct 31	Stochastic age structured models continued, in R (assignment 7, part 2) <b>Stephanie Shaw</b>
Nov 7	Tagging study to estimate fishing mortality with Monte Carlo uncertainty analysis (assignment #8) <b>Stephanie Shaw</b>
Nov 14	Virtual Population Analysis, VPA Lake Escanaba walleye and Lake

Lochloosa crappie (assignment #9)

Nov 22 Evaluation of management policies, group exercise

Nov 28 Thanksgiving

Dec 6 Paper due

### **Downloads**

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

Poptools add-in for Excel: <http://www.poptools.org/>

R: <http://www.r-project.org/>

Suggested R Gui: R Studio: <http://rstudio.org/>

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## Writing Assignment

The writing assignment will allow you to gain experience in reporting fisheries analyses in the form of a peer-reviewed journal article. The objective of this assignment is for you and a partner (two person team) to complete a peer-reviewed journal article during the semester. It can be a short paper such as a note or Management Brief, but you are required to submit all sections of this paper and a final manuscript at the end of the semester.

You should choose a paper topic that will hopefully complement your thesis work and utilize the methods that we cover in this course. Examples of topics for your paper for consideration are listed below, but you are welcome to deviate from these topics to suit your interests and research area.

- comparison of fish growth rates between locations, populations, or genders*
- testing for differences in size at maturity between locations, populations, or genders*
- yield per recruit modeling to evaluate optimal minimum size limits and fishing mortality rates*
- assessment of potential for recruitment overfishing in a fishery*
- evaluation of how stochastic recruitment could influence the ability to detect change in fisheries*
- evaluating bias in age estimation and its effect on population models*
- incorporation of parameter uncertainty into population model predictions*
- assessing uncertainty in passive tagging estimates of exploitation rate*
- comparison of methods to estimate natural mortality for a fish species*
- meta-analysis of mortality estimates with implications to fisheries*
- evaluating allocation strategies between commercial and recreational fisheries*
- literature review, topic to be discussed with M. Allen*

The topic you choose should be discussed and approved by the instructor, and it can vary from the examples above.

Before selecting paper subject should evaluate literature on the topic and confirm that the study has some merit for publication. Use the Web of Science through the UF library for a literature search: <http://www.uflib.ufl.edu/msl/search/databases.html>

### Paper Deadlines:

- Sep 10 - paragraph describing your study objective and the need for the study
- Sep 24 - draft Introduction
- Oct 8 - draft Methods
- Oct 29 - draft Results
- Nov 12 - draft Discussion
- Dec 3 - turn in full final paper for grade

## **Academic Honesty, Software Use, UF Counseling Services, Services for Students with Disabilities**

In 1995 the UF student body enacted an [honor code](#) and voluntarily committed itself to the highest standards of honesty and integrity. When students enroll at the university, they commit themselves to the standard drafted and enacted by students.

In adopting this honor code, the students of the University of Florida recognize that academic honesty and integrity are fundamental values of the university community. Students who enroll at the university commit to holding themselves and their peers to the high standard of honor required by the honor code. Any individual who becomes aware of a violation of the honor code is bound by honor to take corrective action. The quality of a University of Florida education is dependent upon community acceptance and enforcement of the honor code.

**The Honor 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.**

On all work submitted for credit by students at the university, the following pledge is either required or implied: **"On my honor, I have neither given nor received unauthorized aid in doing this assignment."**

The university requires all members of its community to be honest in all endeavors. A fundamental principle is that the whole process of learning and pursuit of knowledge is diminished by cheating, plagiarism and other acts of academic dishonesty. In addition, every dishonest act in the academic environment affects other students adversely, from the skewing of the grading curve to giving unfair advantage for honors or for professional or graduate school admission. Therefore, the university will take severe action against dishonest students. Similarly, measures will be taken against faculty, staff and administrators who practice dishonest or demeaning behavior.

Students should report any condition that facilitates dishonesty to the instructor, department chair, college dean or Student Honor Court.

*(Source: 2010-2011 Undergraduate Catalog)*

It is assumed all work will be completed independently unless the assignment is defined as a group project, in writing by the instructor.

This policy will be vigorously upheld at all times in this course.

### **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**

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.

- *University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575, [www.counseling.ufl.edu/cwc/](http://www.counseling.ufl.edu/cwc/)*

Counseling Services

Groups and Workshops

Outreach and Consultation

Self-Help Library

Training Programs

Community Provider Database

- *Career Resource Center, First Floor JWRU, 392-1601, [www.crc.ufl.edu/](http://www.crc.ufl.edu/)*

### **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.

0001 Reid Hall, 352-392-8565, [www.dso.ufl.edu/drc/](http://www.dso.ufl.edu/drc/)