FAS - 6337C Fish Population Dynamics – Fall 2017

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:

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Class will meet on Thursday mornings, time TBD

Video lectures and labs (link)

References and Reading List

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:

Assignment	Amount	Worth	Total
Laboratory Exercises	9	8%	72%
Midterm Exam	1	28%	100%

Letter Grade	GPA
A	4
A-	3.7
B+	3.3
B	3
B-	2.7
C+	2.3
C	2
C-	1.7
D+	1.3
D	1
D-	0.7
E	0
WF	0
I	0
NG	0
U	0

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Lecture Syllabus

1. Introductory Material
   - course goals
   - what is a fishery?
   - history of fisheries management
   - what is a model?
2. Population Growth
   - rates of increase (finite versus instantaneous)
   - derivation -models
3. 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
4. Mortality -finite and instantaneous rates
   - fishing and natural mortality expression
   - conditional mortality rates
   - compensatory versus additive mortality
   - estimation techniques and confidence intervals
5. Recruitment
   - definitions
   - estimation
   - stock-recruitment relationships
   - environmental factors
   - stochastic methods
6. Population Models
   - equilibrium yield model
   - incorporating variation in models
   - use and misuse of stochastic models
7. Fish Population Trends
   - cycles in fish populations
   - effects of density
   - abiotic versus biotic influences on abundance
   - effects
8. Models based on Catch-at-Age
   - Virtual Population Analysis
   - Statistical Catch-at-Age model
9. Review and Concluding Topics

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Laboratory Syllabus

Data for all labs can be obtained from the Canvas page. Each laboratory will require a lab report that includes:

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

Schedule

Dates	Topic
Aug 24	Lab overview, introduction to likelihood methods and R
Aug 31	Assessment of fish size structure in R (assignment #1)
Sep 07	Estimates of fish growth, fitting growth models in R, spotted seatrout (assignment 2, part 1)
Sep 14	Continue growth analysis AIC comparison of model parameters (assignment 2, part 2)
Sep 21	Total mortality estimation and comparison with ANCOVA in R, black crappie (assignment #3)
Sep 28	Estimating size at maturity and comparison of curves, white grunt (assignment #4)
Oct 05	Equilibrium yield per recruit model (assignment #5)
Oct 12	Fitting stock-recruitment curves, black crappie and walleye (assignment #6)
Oct 19	Stochastic age structured model with biological reference points, spotted seatrout and largemouth bass (assignment #7, part 1)
Oct 26	Tagging study to estimate fishing mortality with Monte Carlo uncertainty analysis (assignment #8)
Nov 02	Stochastic age structured models continued (assignment #7, part 2)
Nov 09	Virtual Population Analysis, VPA Lake Escanaba walleye and Lake Lochloosa crappie (assignment #9)
Nov 16	Group work
Nov 23	Thanksgiving, no class
Nov 30	Last day of class