

# APPLIED FISHERIES STATISTICS

Fall 2018

FAS 5335C (section 02C3) and FAS 4932 (section 02CD)

4 credit hours

Tuesdays and Thursdays: Periods 3-4 (9:35am – 11:30am)

3108 McCarty Hall B

## **Overview:**

Ever wonder what to do with all that data? Too much data? Not enough data? Right kind of data? Maybe you should have thought of that before you ever collected it! The goal of this course is to help you organize your data (past or future) and to learn how to apply many of the statistical tests (that you have learned, should have learned, or will learn) to data collected from aquatic systems, along with learning some new methods of sampling, analysis, and presentation.

Topics will include mathematical distributions, transforming data, outliers, significant figures, number of samples needed, effect of sampler size, sample design, mark-recapture and depletion methods of estimating abundance, length-frequency analysis, length-weight relationships ( $K$ ,  $W_r$ , ANOCOVA), and basic statistical tests (e.g., t-tests, paired t-tests, tests of normality, correlations, simple ANOVAs, regression analysis). Additional topics will include ratios, pseudo-replication, nonparametric statistics, repeated-measures ANOVA, multiple comparison testing, and variable selection techniques. Handouts (computer printouts and primary literature) will be used extensively as supporting materials. Students will learn the basics of SAS (Statistical Analysis System), JMP and EXCEL programming for data management and analysis, along with being introduced to R (Hopefully!).

Grades will be based on weekly/biweekly problems sets and a class project. Each student will conduct an independent "sampling" project on a fisheries or aquatic science topic of their choice, including review of the literature, proposal and budget preparation, completion of field and/or laboratory work, and preparation of paper and oral presentation based on their research.

**Instructor:**

Dr. Chuck Cichra  
Professor / Extension Fisheries Specialist  
University of Florida / IFAS  
SFRC - Fisheries & Aquatic Sciences  
7922 NW 71st Street (Room 27, Bldg. 544)  
Gainesville, Florida 32653-3071

Office: (352) 273-3621  
Cell: (352) 339-6173  
Fax: (352) 392-3672  
Email: [CECichra@ufl.edu](mailto:CECichra@ufl.edu)  
Website: <http://sfrc.ufl.edu/people/faculty/cichra/>

**Teaching Assistant:**

Mrs. Crystal Hartman  
Biological Scientist  
University of Florida / IFAS  
SFRC - Fisheries & Aquatic Sciences  
7922 NW 71st Street (Room 25 and 26, Bldg. 544)  
Gainesville, Florida 32653-3071

Office: (352) 273-3622  
Cell: (352) 214-8179  
Fax: (352) 392-3672  
Email: [c.hartman@ufl.edu](mailto:c.hartman@ufl.edu)

**Office Hours:**

Call or e-mail for an appointment, meet after class, or stop in if our doors are open.

Feel free to call or e-mail questions to either of us. Dr. Cichra will respond to phone calls, text messages, and e-mails almost 24 – 7!

**Course Website:**

This course will be supported by a UF e-learning CANVAS website located at <https://elearning.ufl.edu/>. It will include the course syllabus, PowerPoint presentations, recommended readings, handouts, course assignments, proposal format and budget Excel files, presentation and paper guidelines, and other materials.

## Directions to our offices:

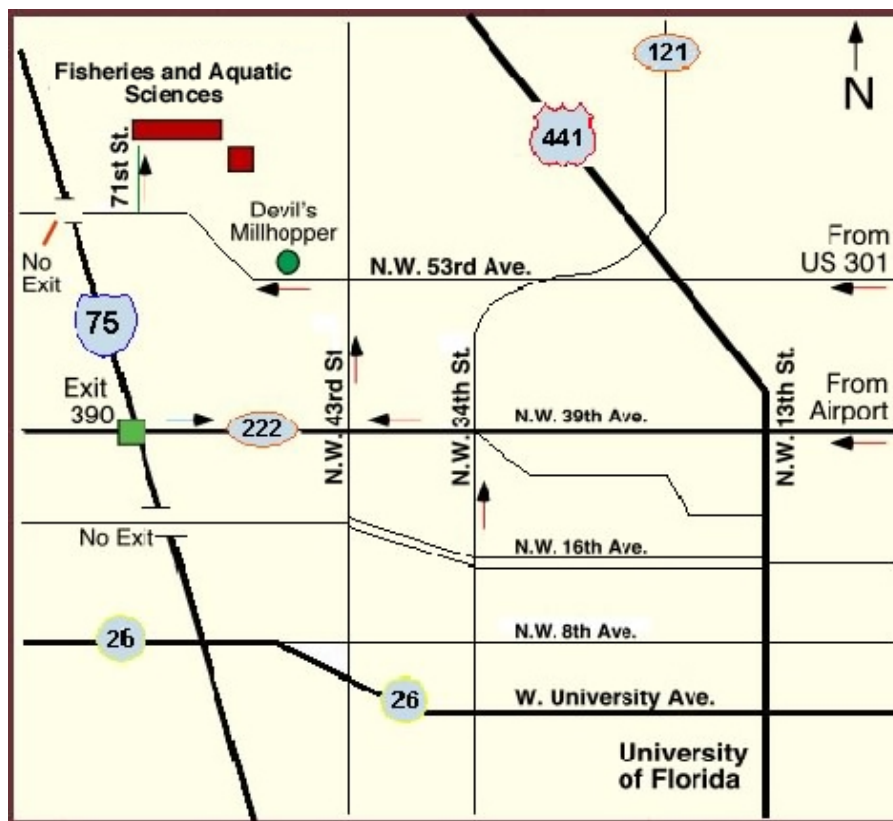
### From UF Campus

1) From campus at the corner of W. University Ave. and NW 13th St. (US 441) go north to NW 53rd Ave. (3.5 mile). Go west past NW 43rd St. and the Devil's Millhopper State Geologic Site to NW 71st St. (4.6 mile). Turn right (north) and go to the end of the paved road (1.1 mile). Fisheries and Aquatic Sciences and the Center for Aquatic and Invasive Plants' buildings are on the right at end of paved road. The Administration Building is the brick building to the east (your right). Our offices are in the longest cream-colored steel strand building.

2) Alternatively, from W. University Ave., you can take NW 34th St. north to NW 39th Ave. (2.5 mile). Turn left (west) and go to NW 43rd St. (1 mile). Turn right. Drive north on NW 43rd St. to NW 53rd Ave. (1 mile). Turn left (west) and proceed as above.

### From Interstate 75

Take Exit 390 at NW 39th Ave. Drive east to NW 43rd St. and proceed as above. There is no exit at NW 53rd Ave.



## Grading:

	<u>Points</u>
Problem Sets	600 Take-home (~8 problem sets)
Class Project	15 Project pre-proposal
	110 Project proposal
	175 Project paper
	100 Final oral presentation
<hr/>	
Total:	1000

<u>Grading Scale</u>	<u>Grade</u>	<u>Points</u>
	A	931-1000
	A-	900-930
	B+	871-899
	B	831-870
	B-	800-830
	C+	771-799
	C	731-770
	C-	700-730
	D+	671-699
	D	631-670
	D-	600-630
	E	0-599

Problem sets / assignments must be turned in to Dr. Cichra by the beginning of lecture on the assigned due date.

Project-related work must be turned in to Dr. Cichra or put into his mailbox in the Fisheries and Aquatic Sciences' main office by 5:00 PM on the assigned due date.

10% of the assignment's total value will be deducted per day for any work not turned in on time.

Excused tardiness for course work will be granted if an acceptable excuse is provided. If you know that you will not be in town on due dates, please make prior arrangements for turning in assignments (preferably early if possible). If you are out of town on the date that something is due, it can be faxed or E-mailed to Dr. Cichra.

# APPLIED FISHERIES STATISTICS - 2018 Schedule DRAFT

(This schedule may change by Aug 30th with input from students and other instructors. Tentative due dates for problem sets will be added)

<u>Tuesday</u>		<u>Thursday</u>	
		Aug 23	Introduction to course
Aug 28		Aug 30	
Sep 04		Sep 06	
Sep 11	3086 McCarty B - SAS Lab	Sep 13	Pre-proposal due
Sep 18		Sep 20	
Sep 25	3086 McCarty B - Lit Lab	Sep 27	
Oct 02	3086 McCarty B - EXCEL 1	Oct 04	EXCEL 2
Oct 09	Proposal due	Oct 11	
Oct 16	3086 McCarty B - SAS JMP	Oct 18	
Oct 23		Oct 25	
Oct 30		Nov 01	SAS JMP
Nov 06		Nov 08	
Nov 13		Nov 15	
Nov 20		Nov 22	No Class - Thanksgiving
Nov 27	Paper due	Nov 29	Oral Presentations
Dec 04	Oral Presentations		

**NO FINAL Exam!**

**Classes will be held every Tuesday and Thursday, unless announced otherwise.**

**Classes will consist of primarily lectures/discussions, along with computer sessions (SAS, JMP, and EXCEL).**

## Course Topics / Outline:

### Organize / Explain Course

Purpose, instructors, topics, grading, schedule, project, proposal, paper, presentation

### Common sampling techniques

### Sampling and basic statistics

Mean, median, mode, standard deviation, variance

Significant figures

Sampling designs

### Distributions

Terminology

Histograms

Value in sampling

Mathematical frequency distributions -  
generation and application

Positive binomial

Poisson series

Negative binomial

Normal

### Normality

Tests for normality

Violation of statistical assumptions

What do you do if your data are not normal?

Transformations

What are transformations?

Why do we transform data?

Methodologies

Common transformations for fisheries and aquatic science data

Tests to see if transformations worked

If you can't transform, then what?

Non-parametric statistics?

### Outliers

What are they?

Methods to see if you have them (Detection)

Effects of outliers on analyses

What do you do with them when detected?

### Catch-per-unit-of-effort (CPUE) sampling

Number of samples

Size of samples(r)

### Mark-recapture techniques

What is it?

Why use it?

Assumptions

What happens if you violate them?

How much can you violate them?

- Methodology
  - Biases
  - Calculating confidence limits
  - Sample sizes - allocation of effort (M vs C)
- Estimating fish abundance by depletion
  - Zippin method
- Comparing distributions
  - Size distributions
  - Age structure
  - Chi-square analysis
  - Kolmogorov-Smirnov test
- Length-weight relationships
  - Condition factors (K)
  - Relative weights (Wr)
  - Methodology
    - Standard weights
    - Length-weight regressions
    - Analysis of covariance
- Length-frequency analysis
  - Histograms
  - Anderson's numerical analyses
    - Proportional stock density (PSD)
    - Relative stock density (RSD)
- Empirical modeling
  - What is it?
  - Why use it?
  - An example using regression analysis
- Pseudo-replication
- Repeated-Measures Analysis of Variance
- Multiple comparison testing
- Statistical methods (SAS examples will be used throughout the course)
  - T-test
  - Paired t-test
  - Analysis of variance (1-way, 2-way, interaction, etc.)
  - Analysis of covariance
  - Correlation analysis
  - Regression analysis
    - Simple / Multiple
  - Variable selection techniques (forward, backward, stepwise)
  - Non-parametric

# FAS 5335C / FAS4932 - Applied Fisheries Statistics

## Project Paper Grading Sheet

<u>Content</u>		<u>POINTS</u>
Abstract	9	_____
Goal of study, objectives, introduction	17	_____
Description of study site & methods	35	_____
Analysis of project data (including project design)	35	_____
Literature review	17	_____
Overall discussion	26	_____
 <u>Style</u>		
Readability	7	_____
Follows AFS guidelines	18	_____
Neatness, grammar	11	_____
Total	175	_____

COMMENTS:



The following guidelines will be used to grade the oral presentation:

<b>Name of Presenter:</b>	
<b>Topic:</b>	<b>Comments:</b>
<b>Overall Presentation</b>	<b>30</b>
Voice	5
Clarity	5
Mannerisms	5
Professionalism	5
Flow	5
Grammar	5
<b>Organization (completeness of talk)</b>	<b>30</b>
Introduction	3
Objective(s)	3
Method(s)	3
Data presentation	3
Conclusion(s)	3
Take Home Message	2
Logical progression	4
Presented information relevant to talk	4
Stayed within time limit	5
<b>Visual Aids</b>	<b>30</b>
Overall appearance	10
Design/colors/fonts/cramping	4
Labels	4
Ease of understanding	5
Effectiveness	5
Relevant to talk	2
<b>Research criteria &amp; Merit</b>	<b>10</b>
Appropriate study design & methods	3
Appropriate statistical analyses	3
Originality	2
Contribution to science/management	2
<b>TOTAL</b>	<b>/100</b>

### **Pertinent References:**

- Boyd, C.E. 1979. Water quality in warmwater fish ponds. Auburn University, Auburn Experiment Station, Auburn, Alabama. 359pp.
- Carlander, K.D. 1950. Handbook of Freshwater Fishery Biology, Volume One. The Iowa State University Press, Ames, Iowa. 752pp. (Freshwater fishes exclusive of the Perciformes)
- Carlander, K.D. 1977. Handbook of Freshwater Fishery Biology, Volume Two. The Iowa State University Press, Ames, Iowa. 431pp. (Centrarchids)
- Elliott, J.M. 1971. Some methods for the statistical analysis of samples of benthic invertebrates. Freshwater Biological Association, Scientific Publication No. 25. 148pp.
- Guy, C.S. and M.L. Brown. 2007. Analysis and interpretation of freshwater fisheries data. American Fisheries Society, Bethesda, Maryland. 961pp.
- Hoyer, M.V. and D.E. Canfield, Jr. 1994. Handbook of common freshwater fish in Florida lakes. SP160. University of Florida, Gainesville, Florida. 189pp.
- Kohler, C.C. and W.A. Hubert. (Editors) 1993. Inland fisheries management in North America. American Fisheries Society, Bethesda, Maryland. 594pp.
- Murphy, B.R. and D.W. Willis. (Editors) 1996. Fisheries Techniques, Second Edition. American Fisheries Society, Bethesda, Maryland. 732pp.
- Novinger, G.D. and J.G. Dillard. (Editors) 1978. New approaches to the management of small impoundments. Special Publication No. 5. American Fisheries Society, Bethesda, Maryland. 132pp.
- Ricker, W.E. 1968. Methods for assessment of fish production in freshwaters. IBP Handbook No. 3. Blackwell Scientific Publications, Oxford, England. 313pp.
- Ricker, W.E. 1975. Computation and interpretation of biological statistics of fish populations. Bulletin 191. Fisheries Research Board of Canada, Ottawa, Canada. 382pp.
- Seaman, W. (Editor) 1985. Florida aquatic habitat and fishery resources. Florida Chapter, American Fisheries Society, Eustis, Florida. 543pp.
- Summerfelt, R.C. and G.E. Hall. (Editors) 1987. Age and growth of fish. The Iowa State University Press, Ames, Iowa. 544pp.

**Numerous pieces of primary literature, sample data analyses, computer programs, manuals, and reports will be handed out and/or placed onto the course CANVAS e-learning website during this semester.**

### **Academic Honesty:**

As a result of completing the registration form at the University of Florida, every student has signed the following statement: “I understand that the University of Florida expects its students to be honest in all their academic work. I agree to adhere to this commitment to academic honesty and understand that my failure to comply with this commitment may result in disciplinary action up to and including expulsion from the University.”

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: <https://counseling.ufl.edu/> , 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/](http://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/](http://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.