APPLIED FISHERIES STATISTICS

Fall 2012, FAS 5335C (section 008F)
(also FAS 4932, section 05E1)

4 credit hours
Tuesdays and Thursdays: Periods 3-4 (9:35am – 11:30am)
MAEB Room 234

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 and analysis.

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, Wₚ, 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) and EXCEL programming for data management and analysis, along with being introduced to JMP and R.

Grades will be based on weekly/biweekly problems sets, one in-class exam, 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

Phone: (352) 273-3621  
Fax: (352) 392-3672  
Email: CECichra@ufl.edu  
Website: [http://sfrc.ufl.edu/faculty/cichra/index.html](http://sfrc.ufl.edu/faculty/cichra/index.html)

**Teaching Assistant:**  
Ms. Amanda Croteau (Ph.D. student)  
Graduate Assistant and Alumni Fellow  
University of Florida / IFAS  
SFRC - Fisheries & Aquatic Sciences  
7922 NW 71st Street (Room 33F, Bldg. 544)  
Gainesville, Florida 32653-3071

Fax: (352) 392-3672  
Email: acroteau@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.
Directions:

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 mi.). Go west past NW 43rd St. and the Devil's Millhopper State Park to NW 71st St. (4.6 mi.). Turn right (north), pass the USGS buildings and go to the end of the paved road (1.1 mi.). Fisheries and Aquatic Sciences and the Center for Aquatic and Invasive Plants’ buildings are on right at end of paved road. The Administration Building is the brick building to the east (your right). Our offices are in the longest steel strand building.

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

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
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<tbody>
<tr>
<td>Exam</td>
<td>100 In-class</td>
</tr>
<tr>
<td>Problem Sets</td>
<td>500 Take-home, generally each week</td>
</tr>
<tr>
<td>Class Project</td>
<td>15 Project pre-proposal</td>
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<tr>
<td></td>
<td>110 Project proposal</td>
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<td></td>
<td>175 Project paper</td>
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<tr>
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<td>100 Final oral presentation</td>
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**Total: 1000**

### Grading Scale

<table>
<thead>
<tr>
<th>Grade</th>
<th>Points</th>
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<tbody>
<tr>
<td>A</td>
<td>931-1000</td>
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<tr>
<td>A-</td>
<td>900-930</td>
</tr>
<tr>
<td>B+</td>
<td>871-899</td>
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<tr>
<td>B</td>
<td>831-870</td>
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<tr>
<td>B-</td>
<td>800-830</td>
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<tr>
<td>C+</td>
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<td>D-</td>
<td>600-630</td>
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<tr>
<td>E</td>
<td>0-599</td>
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Problem sets **must** be turned in to Dr. Cichra or Amanda by the beginning of lecture on the assigned due date.

Project-related work **must** be turned in to Dr. Cichra, Amanda or to 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 if 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). Assignments can be faxed or E-mailed.
**Schedule:** (This **may** change by Sep 04 with input from the students and TA)

<table>
<thead>
<tr>
<th>Tuesday</th>
<th>Thursday</th>
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<tbody>
<tr>
<td>Aug 23 Introduction to course</td>
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<tr>
<td>Aug 28</td>
<td>Aug 30 Computer Lab (3086 McCarty B)</td>
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<tr>
<td>Sep 04</td>
<td>Sep 06</td>
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<tr>
<td>Sep 11</td>
<td>Sep 13 Pre-proposal due</td>
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<td>Sep 18</td>
<td>Sep 20</td>
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<td>Sep 25</td>
<td>Sep 27</td>
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<tr>
<td>Oct 02</td>
<td>Oct 04 Proposal due</td>
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<tr>
<td>Oct 09 Exam (In-Class)</td>
<td>Oct 11</td>
</tr>
<tr>
<td>Oct 16 Guest lecturer (No Class?)</td>
<td>Oct 18</td>
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<td>Oct 23</td>
<td>Oct 25</td>
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<td>Oct 30</td>
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<td>Nov 06</td>
<td>Nov 08</td>
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<td>Nov 13</td>
<td>Nov 15</td>
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<tr>
<td>Nov 20</td>
<td>Nov 22 No Class - Thanksgiving</td>
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<tr>
<td>Nov 27 Paper due – No Class?</td>
<td>Nov 29</td>
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<tr>
<td>Dec 04</td>
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<tr>
<td>Dec 11 3-5pm Final Exam</td>
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Guest lecturers may include Dana Bigham, other FAS faculty, or staff.

Oral Presentations (held during ‘final exam’ time?) – to be discussed on Aug 23

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

Ratios in aquatic sciences

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
  Variable selection techniques (forward, backward, stepwise)
# Project Paper Grading Sheet

<table>
<thead>
<tr>
<th>Content</th>
<th>POINTS</th>
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<tbody>
<tr>
<td>Abstract</td>
<td>9</td>
</tr>
<tr>
<td>Goal of study, objectives, introduction</td>
<td>17</td>
</tr>
<tr>
<td>Description of study site &amp; methods</td>
<td>35</td>
</tr>
<tr>
<td>Analysis of project data (including project design)</td>
<td>35</td>
</tr>
<tr>
<td>Literature review</td>
<td>17</td>
</tr>
<tr>
<td>Overall discussion</td>
<td>26</td>
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</table>

**Style**

<table>
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<tbody>
<tr>
<td>Readability</td>
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<tr>
<td>Follows AFS guidelines</td>
<td>18</td>
</tr>
<tr>
<td>Neatness, grammar</td>
<td>11</td>
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</table>

**Total** 175

**COMMENTS:**
Pertinent References:


Numerous primary pieces of literature, sample data analyses, computer programs, and reports will be handed out during this course.
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.”

UF Counseling Services:

Resources are available on-campus for students having personal problems or lacking clear career and academic goals which interfere with their academic performance. These resources include:

1. University Counseling Center, 301 Peabody Hall, 392-1575, personal and career counseling;
2. Student Mental Health, Student Health Care Center, 392-1171, personal counseling;
3. Sexual Assault Recovery Services (SARS), Student Health Care Center, 392-1161, sexual assault counseling; and
4. Career Resource Center, Reitz Union, 392-1601, career development assistance and counseling.

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.

We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.