Applied Fisheries Statistics – Fall 2022
FAS 4932 (section 3C24) and FAS 5335C (section 2929)

1 Course Overview

Course description:

Ever wonder what to do with all those 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, analyzing, and presenting data.

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 animal abundance, length-frequency analysis, length-weight relationships (K, Wr, 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, handbooks, 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 approximately biweekly problem 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 a paper and oral presentation based on their research.

- 4 Credits
- Fall Semester of even years
- Format: **Face-to-face lectures/discussions** will be held on Tuesdays and Thursdays: Periods 3-4 (9:35am – 11:30am) in 3108 McCarty Hall B. The **lab will consist of an independent study** that will be designed and conducted by each student, along with help from the instructor, co-instructors, and fellow students in the class. Dates and format will depend on the study design.
- 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, data files, recommended readings, handouts, course assignments, proposal format and budget Excel files, presentation and paper guidelines, and other materials.

Course Prerequisites: none

Instructor:

> **Dr. Chuck Cichra**
> Professor / Extension Fisheries Specialist
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Co-Instructors:

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- **Contacting us**: Please use e-mail or text for the fastest response. Dr. Cichra will respond to phone calls, text messages, and e-mails almost 24 – 7!
- **Office hours**: Available by email or phone; office visits available by appointment. Dr. Cichra will be available in the classroom before and after each lecture. One-on-one Zoom sessions can be scheduled to go over course content, problem sets, project-related work, or any other topic.
- **Textbook(s) and/or readings:** There is no required text for this course. Online readings will be provided for each learning topic. Some of the readings will be taken from:

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. (A third edition, published in 2010, is available)

Murphy, B.R. and D.W. Willis. (Editors) 1996. Fisheries Techniques, Second Edition. American Fisheries Society, Bethesda, Maryland. 732pp. (A third edition, published in 2013, is available)

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.

2 Learning Outcomes

By the end of this course, each student will be able to:

- organize and manage data, code data, proof data

- design basic sampling programs, including determining the number of samples needed (power analysis), effect of sampler size and pseudo-replication on results

- use mathematical distributions (positive binomial, negative binomial, Poisson series) to model and determine how "things" are distributed

- transform data, deal with outliers, and present data with the appropriate number of significant figures

- estimate abundance via CPUE, mark-recapture, and depletion methods (Zippin) - including estimating numbers of "fish" needed (M and C), calculating confidence intervals, assumptions made

- analyze length-frequency data using histograms, K-S test, Chi-square test, PSS (PSD and RSD) analysis

- analyze length-weight relationships (K, W_r, ANOCOVA)

- perform and interpret the results from basic statistical tests (e.g., mean (arithmetic and geometric), standard deviation, variance, standard error, Z scores, CV, t-tests, paired t-tests, tests of normality, correlation analysis, simple ANOVAs, multiple comparisons, regression analysis (including variable selection techniques), Chi-square test, Kolmogorov-Smirnov test, variance to mean ratio test)

- perform basic nonparametric statistics (e.g., Wilcoxon-Mann-Whitney (or rank sum) test, Wilcoxon signed-rank test, Kruskal–Wallis test)

- write and run SAS (Statistical Analysis System) programs for data management and analysis, conduct similar analyses in EXCEL and JMP, and be introduced to other statistical software such as R (become familiar with utilizing UF online apps)

- write a proposal, including preparation of a budget

- search and review scientific literature via online computer data bases

- design and conduct a "scientific study" in an area of your interest

- communicate the findings of your research, both in written and oral form

3 Course Logistics

Students may access lectures, assignments, readings, and supporting materials through the course Canvas website, as they become available.

Technology Requirements:

- A computer or mobile device with high-speed internet connection.
- Latest version of web browser. Canvas supports only the two most recent versions of any given browser.

This course will be taught in a face-to-face format. If on-line synchronous sessions become necessary, these sessions will 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. Dr. Cichra requests that all students use video during the synchronous Zoom lectures, so that he can better interact with students during the sessions.

3.1 Description of Assessments & Activities

To make sure that students understand the course material, approximately 10 problem sets will be assigned during the semester. They will be due a minimum of one week after they are assigned. Each will be worth approximately 50 points, for a total of 500 points.

A major activity and learning experience of this course will be the design and implementation of an independent research project, including the written and oral presentation of the findings. The preproposal, proposal, paper, and oral presentation will be worth 400 points.

Class sessions will be highly interactive in nature, rather than given in a "lecture" format. It is imperative that students attend each class session. Attendance will therefore count for 100 points. Students will lose 10 points (1% of the total points for the course) for each <u>unexcused</u> missed session.

- Each assignment must be submitted via Canvas by the <u>beginning</u> of lecture on the assigned due date.
- Project-related work (pre-proposal, proposal, and paper) must be submitted via Canvas by 5:00 PM on the assigned due date.
- 10% of the assignment/work's total value will be deducted per day for any item not turned in on time.
- Excused tardiness for course work will be granted if an acceptable excuse is provided.
- If you know ahead of time that you will not be able to meet the due date, pleases inform Dr. Cichra prior to the due date.

3.2 Grades & Grading Scale

	Points	
Assignments/Problem Sets	500	
Attendance at lectures	100	
Class Project	15	Project pre-proposal
	110	Project proposal
	175	Project paper
	100	Final oral presentation
	_____	
Total:	1000	

Grade	Points
Grading Scale	
A	930-1000
A-	900-929
B+	870-899
B	830-869
B-	800-829
C+	770-799
C	730-769
C-	700-729
D+	670-699
D	630-669
D-	600-629
E	0-599

For information on current UF policies for assigning grade points, see
https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

Graduate students: This course is being co-taught to undergraduate (FAS 4932) and graduate (FAS 5335C) students. Graduate students must do <u>additional</u> work to obtain graduate credit. This will consist of co-teaching one of the lecture topics, including providing appropriate examples and references. Half of the points (50 points), assigned to undergraduate students for attendance, will be assigned to graduate students for this work. Attendance will thus be worth 50 points rather than 100 points for graduate students. Graduate students will coordinate with Dr. Cichra to determine what topic will be covered.

4 Learning Content

Date	Day	Topic	Assignments Due
Aug 25	Thursday	Introduction to course Organization (syllabus) Individual project	
Aug 30	Tuesday	SAS programming	PS1 – Who am I?
Sep 1	Thursday	Sampling methods I and II	
Sep 6	Tuesday	SAS programming	
Sep 8	Thursday	Distributions – basic statistics	PS2 – SAS print program
Sep 13	Tuesday	Distributions	PS3 – K, print, subset, plot
Sep 15	Thursday	Outliers in data Distributions	PS4 – PNPP
Sep 20	Tuesday	Discuss projects	Project pre-proposal
Sep 22	Thursday	Distributions – sampler size, number of samples needed	
Sep 27	Tuesday	Scientific literature searches	
Sep 29	Thursday	Transforming data Normality	
Oct 4	Tuesday	Proposal preparation Budgets	
Oct 6	Thursday	Analyzing data with Excel I	PS5 – Literature
Oct 11	Tuesday	Analyzing data with Excel II	PS6 – Transforming data, number of samples
Oct 13	Thursday	Length-weight relationships K, Wr, Ws, regressions	Project Proposal
Oct 18	Tuesday	Length-weight relationships ANOCOVA	PS7 – Excel
Oct 20	Thursday	SAS JMP	
Oct 25	Tuesday	Size structure – Length frequency histograms, Chi-Square test, K-S test	
Oct 27	Thursday	Size structure – PSD, RSD, PSS	PS8 – SAS JMP
Nov 1	Tuesday	Mark-recapture estimates	
Nov 3	Thursday	Mark-recapture estimates	PS9 – Size structure
Nov 8	Tuesday	Writing research papers, Giving a professional talk	

Nov 10	Thursday	Zippin depletion estimates	
Nov 15	Tuesday	ANOVA – multiple comparisons Regression – variable selection techniques	PS10 – Peterson confidence limits, number of M and C
Nov 17	Thursday	Sample designs, rounding, significant figures	
Nov 22	Tuesday	Discuss project papers	PS11 – Zippin estimates
Nov 24	Thursday	NO CLASS - Thanksgiving	
Nov 29	Tuesday	Non-parametric methods, pseudoreplication	Project paper
Dec 1	Thursday	Project presentations	PowerPoint talk
Dec 6	Tuesday	Project presentations	PowerPoint talk

4.1 Readings

Representative examples:

Anderson, RO and RM Newmann. 1996. Length weight and associated structural indices. Pages 447-481 in: Murphy, BR and DW Willis, editors. Fisheries Techniques. 2nd ed. American Fisheries Society, Bethesda, Maryland.

Wege, GJ, and R0 Anderson. 1978. Relative weight (W,): a new index of condition for largemouth bass. Pages 79-91 in: Novinger, GD and JG Dillard, editors. New Approaches to the Management of Small Impoundments. North Central Division, American Fisheries Society, Special Publication Number 5, Bethesda, Maryland.

Willis, DW, BR Murphy, and CS Guy. 1993. Stock density indices: Development, use, and limitations. Reviews in Fisheries Science, 1(3): 203-222.

These, along with other materials will be available via the course Canvas website.

5 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.

5.1 Late Submissions & Make-up Requests

It is the responsibility of the student to access on-line readings and assignments, and to maintain satisfactory progress in the course. 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

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).

5.2 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.

5.3 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, and Geomatics Sciences may 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/.

5.4 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 unless the instructor provides explicit permission for you to collaborate on course tasks (e.g., assignments and papers). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to 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.

5.5 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.

5.6 Services for Students with Disabilities:

The Disability Resource Center (Phone 352-392-8565) 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: https://disability.ufl.edu/. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation.

5.7 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.

6 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

6.1 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/

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 (Dr. Cichra and Crystal Hartman) are in the <u>longest</u> cream-colored steel-strand building. Marina's office is in the "Blueberry 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.