Course Syllabus -- WL 720/720L
3 Credit Hours
QUANTITATIVE FISHERIES SCIENCE
South Dakota State University
Fall 2009

Instructor: Michael L. Brown, Ph.D.
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Office hours: SNP 141B, no formal hours; mornings preferable or by appointment

Lecture: SNP (Biostress) 179, 11:00-12:50 Tuesday
Lab: SAG (Ag Hall) 113, 10:00-12:50 Wednesday

Course Description: An advanced analytical fisheries course that focuses on quantitative techniques. Emphasis is placed on populations (e.g., recruitment, growth, mortality), and quantitative assessments of communities (e.g., predator-prey interactions) and ecosystems (e.g., biostressors). Suggested background courses include population dynamics, experimental design, and graduate statistics and/or biometry.

This is an analytical, problem-solving course that builds upon the basic principles of fish population dynamics and fisheries management through the application of quantitative analytical techniques and modeling. Emphasis will be placed on population-level parameter estimation and scientific hypothesis testing using a variety of statistical techniques.

Prerequisite Courses: There are no prerequisites for this course; however, the student should have an adequate working knowledge of fisheries management, population dynamics, research design, and graduate-level statistics.

Technology Skills: A working knowledge of data management, word processing, statistical and scientific graphics software is important. Additionally, logic skills are often more important than math skills in solving statistical problems.

Course Goals: Upon completion of this course, the student should be:

- Familiar with some of the contemporary analytical fisheries literature.
- Able to apply current quantitative methods used in common fisheries data analyses.
- More confident in analytical problem solving and critical thinking.
- Able to more effectively communicate statistical ideas.

Required Text: Guy, C.S., and M.L. Brown (editors). 2007. Analysis and interpretation of freshwater fisheries data. American Fisheries Society (AFS), Bethesda, Maryland. ($68, AFS member price [8/2007], hardcover only.)

Course Format and Instructional Method: This course will include lectures and discussions of readings composing one, two-hour period each week. Lectures will summarize the high points; ensuing discussions will target relevant topics in greater detail. (A sign-sheet for leading paper discussions will be available during the first class meeting.) This format should provide an interactive environment whereby you gain greater insight as we explore analytical approaches to fisheries data.

The focus of the lab is to advance your analytical and interpretive skills in statistical modeling through practical application. Thus, the lab portion of this course will cover topic-related analytical computer

application projects. Statistical Analysis Systems (SAS) and MicroSoft Excel (e.g., add-ins) will be the primary software tools used for lab work.

Expectations and Evaluation: The primary expectation for this course is that students are fully prepared to interact and contribute to class discussions, individual and group activities. Even though attendance will not be taken, students are fully responsible for all course content.

Evaluations will be based on individual discussion/participation (24%), lab projects (16%), a mid-term quiz (20%), and a semester project (manuscript 20%, presentation 20%). Grading will be based on the traditional format (i.e., A = 90-100%; B = 80-89%; C = 70-79%; D = 60-69%; and, F <60%. Point allocation and activity details are as follows:

Activity	Points
Discussion (2 @ 40pts)	80
Discussion participation (8 @ 5 pts)	40
Lab projects (4 @ 20 pts ea.)	80
Mid-term exam	100
Semester project:	
Presentation (Dec. 1, 2)	100
Manuscript (Dec. 8)	100
Total points	500

Discussion: Chapters from *Analysis and Interpretation of Freshwater Fisheries Data* (AIFFD) and topic papers are scheduled on a weekly basis. I will cover the basic information from AIFFD and lead those discussions.

Paper discussions (~10 minutes) will be student-led. The primary objectives of these sessions are to stimulate critical and creative thinking, to help you explore and solve problems, and to develop interest in further learning. Each student will be responsible for providing an oral overview and leading a discussion on two papers during the semester. (I could randomly select a discussion leader at the beginning of a class, but I prefer that leaders be well-prepared.) Even though you may not be the discussion leader for a given paper, you must have read the material and be prepared to participate. Discussion leaders may use a short PowerPoint presentation to facilitate their discussion; email the PPT file to me prior to class.

Discussion leaders are expected to be well-prepared and to communicate points thoroughly – synthesis and communication are crucial aspects of this activity. You will be rated on preparedness, communication, and time (40 pts). Contributions to discussions will be individually monitored and scored (i.e., +5 pts = participant, 0 pts = nonparticipant).

Lab projects: Lab work will consist of programming, manipulating data, and interpreting program code and analysis output. You will have four assignments (i.e., size structure, age & growth, mortality, and CPUE) that will result in a concise summary (e.g., a brief introduction, methods, results and discussion, a few supporting references, and visuals [figures/tables]). During the course of these activities, I encourage collaboration in problem solving; however, written submissions are to be your own work and must exhibit good writing skills. Collection of data sets to accomplish these assignments will be a group effort.

Lab assignments will be due by 5:00 p.m. on the Friday following the lab. Late submissions are penalized one point per day, unless you receive prior permission for the late assignment.

Aside from Ag Hall 113 (7 a.m. – 10:00 p.m., M – F, except during scheduled classes), SAS is available in other labs around campus. We have two licenses in the grad computer lab (SNP 143), but if those

computers stay busy then the following labs provide an alternative: SOR 099 (University Police Dept.), SNF 142 (Nursing, Family and Consumer Sci.), and SBL 117 (Briggs Library, card access). You can also purchase a copy of SAS Learning Edition software for use on your personal PC or laptop at http://www.onthehub.com/sas/ for $60. The primary limitations to SAS LE are that it is limited to 1,500 observations, has a "die" date (Dec. 31, 2011), and it licensed for use on one workstation at a time.

Mid-term exam: The exam will include short, essay-like questions that focus on such topics as the scientific process, logic, data analysis and interpretation. Format of make-up exams will be at my discretion. Other details TBA.

Semester project: The culmination of your project efforts will be a presentation and a manuscript that targets an analytical subject that could contribute to the literature. Presentations will be judged (current AFS judging rubric) by your peers, me and other fisheries faculty. Similarly, I will review (grade) your co-authored manuscript using AFS guidelines.

Tentative Lecture/Discussion Schedule, Topics, and Supporting Documents:

Date	Topic	Supporting documents
1-Sep	No class – AFS meeting, Nashville, TN	
8	Introduction, statistical paradigms	Syllabus, schedule & notes
15	Statistical paradigms and analytical review	Ch. 1 – Brown & Guy; papers*
22	Condition	Ch. 10 – Pope & Kruse; papers*
29	Size structure	Ch. 9 – Neumann & Allen; papers*
6-Oct	No class (OOT); work on class project	
13	Age and growth	Ch. 5 – Isely & Grabowski; papers*
20	Mid-term quiz	
27	Mortality	Ch. 6 – Miranda & Bettoli; papers*
3-Nov	Recruitment	Ch. 4 – Maceina & Pereira; papers*
10	Relative abundance and CPUE	Ch. 7 – Hubert & Fabrizio; papers*
17	Food habits/diet	Ch. 11 – Chipps & Garvey: papers*
24	Class project completion	
1-Dec	Paper presentations	
8	No class – Midwest conference, Springfield, IL	

Note: AIFFD Chapters 2 & 3 are not assigned, but should be studied as background/prep information for the course.

****Discussion Papers (listed in discussion order):***

Sept 15: Statistical Paradigms

Johnson, D.H. 2002. The role of hypothesis testing in wildlife science. Journal of Wildlife Management 66:272-276.

Anderson, D.R., K.P. Burnham, and W.L. Thompson. 2000. Null hypothesis testing: Problems, prevalence, and an alternative. Journal of Wildlife Management 64:912-923.

Burnham, K.P., and D.R. Anderson. 2002. Avoiding pitfalls when using information-theoretic methods. Journal of Wildlife Management 66:912-918.

Sept 22: Condition

Blackwell B.G., M.L. Brown, and D.W. Willis. 2000. Relative weight (W_r) status and current use in fisheries assessment and management. Reviews in Fisheries Science. 81:1–44.

Cade, B.S., J.W. Terrell, and M.T. Porath. 2008. Estimating fish body condition with quantile regression. North American Journal of Fisheries Management 28:349–359.

Gerow, K.G., R.C. Anderson-Sprecher, and W.A. Hubert. 2005. New method to compute standard-weight equations that reduces length-related bias. North American Journal of Fisheries Management 25:1288-1300.

Hansen, M.J., and N.A. Nate. 2005. A method for correcting the relative weight (W_r) index for seasonal patterns in relative condition (K_n**)** with length as applied to walleye in Wisconsin. North American Journal of Fisheries Management 25:1256-1262.

Sept 29: Size Structure

Vokoun, J.C., C.F. Rabeni, and J.S. Stanovick. 2001. Sample-size requirements for evaluating population size structure. North American Journal of Fisheries Management 21:660-665.

Maceina, M.J., P.W. Bettoli, and D.R. DeVries. 1994. Use of a split-plot analysis of variance design for repeated-measures fishery data. Fisheries 19:14-20.

Tomcko, C.M., and R.B. Pierce. 2005. Bluegill recruitment, growth, population size structure, and associated factors in Minnesota lakes. North American Journal of Fisheries Management 25: 171-179.

Hoxmeier, R.J., D.D. Aday, and D.H. Wahl. 2009. Examining interpopulation variation in bluegill growth rates and size structure: Effects of harvest, maturation, and environmental variables. Transactions of the American Fisheries Society 138:423–432

Oct 6: No class

Oct 13: Age and Growth

Jackson, Z.J. M.C. Quist, and J.G. Larscheid. 2008. Growth standards for nine North American fish species. Fisheries Management and Ecology 15:107-118.

Katsanevakis, S. 2007. Modelling fish growth: Model selection, multi-model inference and model selection uncertainty. Fisheries Research 81:229-235.

Marschall, M.D., M.P. Holley, and M.J. Maceina. 2009. Assessment of the flathead catfish population in a lightly exploited fishery in Lake Wilson, Alabama. North American Journal of Fisheries Management 29:869–875.

Oct 20: Mid-term week

Oct 27: Mortality

Hoenig, J.M., and T. Gedamke. 2007. A simple method for estimating survival rate from catch rates from multiple years. Transactions of the American Fisheries Society 136:1245-1251.

Maceina, M.J. 2007. Use of piecewise nonlinear models to estimate variable size-related mortality rates. North American Journal of Fisheries Management 27:971-977.

Allen, M.S., K.I. Tugend, M.J. Mann. 2003. Largemouth bass abundance and angler catch rates following a habitat enhancement project at Lake Kissimmee, Florida. North American Journal of Fisheries Management 23:845-855.

Nov 3: Recruitment

Quist, M.C. 2007. An evaluation of techniques used to index recruitment variation and year-class strength. North American Journal of Fisheries Management 27:30-42.

Bunnell, D.B., R.S. Hale, M.B. Vanni, and R.A. Stein. 2006. Predicting crappie recruitment in Ohio reservoirs with spawning stock size, larval density, and chlorophyll concentrations. North American Journal of Fisheries Management 26:1-12.

Hansen, M.J., M.A. Bozek, J.R. Newby, S.P. Newman, and M.D. Staggs. 1998. Factors affecting recruitment of walleyes in Escanaba Lake, Wisconsin, 1958-1996. North American Journal of Fisheries Management 18:764-774.

Nov 10: Relative Abundance

Bonvechio, T.F., M.S. Allen, and R.L. Cailteux. 2005. Relative abundance, growth, and mortality of Suwannee Bass in Four Florida Rivers. North American Journal of Fisheries Management 25:275-283.

Isermann, D.A., D.W. Willis, B.G. Blackwell, and D.O. Lucchesi. 2007. Yellow perch in South Dakota: Population variability and predicted effects of creel limit reductions and minimum length limits. North American Journal of Fisheries Management 27: 918-931.

Rogers, M.W., M.J. Hansen, and T.D. Beard, Jr. 2003. Catchability of walleyes to fyke netting and electrofishing in northern Wisconsin lakes. North American Journal of Fisheries Management 23:1193-1206.

Nov 17: Food Habits

Pope, K.L., M.L. Brown, W.G. Duffy, and P.H. Michaletz. 2001. A caloric-based evaluation of diet indices for largemouth bass. Environmental Biology of Fishes 61: 329–339, 2001.

Schmidt, S.N., J.D. Olden, C.T. Solomon, and M.J. Vander Zanden. 2007. Quantitative approaches to the analysis of stable isotope food web data. Ecology, 88:2793–2802.

Vander Zanden, M.J., B.J. Schuter, N.P. Lester, and J.B. Rasmussen. 2000. Within- and among-population variation in the trophic position of a pelagic predator, lake trout (*Salvelinus namaycush*). Canadian Journal of Fisheries and Aquatic Sciences 57:725-731.

Lab Schedule and Activities:

Date	Activity	Support material
2-Sep	No class – AFS meeting, Nashville, TN	
9	SAS & Excel familiarization	
16	Model selection, resampling and randomization	D2L – SAS, Excel examples
23	Condition analyses & interpretation	D2L – AIFFD 10.2, 10.3
30	Size structure analyses & interpretation	D2L – AIFFD 9.2, 9.3, 9.7 *
7-Oct	No class (OOT); work on class project	
14	Age and growth analyses & interpretation	D2L – AIFFD 5.1, 5.2, 5.4 *
21	Midterm quiz	
28	Mortality analyses & interpretation	D2L – AIFFD 6.4, 6.6
4-Nov	Recruitment analyses & interpretation	D2L – AIFFD 4.4, 4.6, 4.7 *
11	Rel. abundance and CPUE analyses & interpretation	D2L – AIFFD 7.2, 7.3, 7.6 *
18	Food habits/diet analyses & interpretation	D2L – AIFFD 11.4, 11.6, 11.7
25	Class project completion	
2-Dec	Paper presentations	
9	No class – Midwest conference, Springfield, IL	

*Lab write-ups

Academic Freedom and Responsibility Policy:

Freedom in Learning. Students are responsible for learning the content of any course of study in which they are enrolled. Under Board of Regents and University policy, student academic performance shall be evaluated solely on an academic basis and students should be free to take reasoned exception to the data or views offered in any course of study. Students who believe that an academic evaluation is unrelated to academic standards but is related instead to judgment of their personal opinion or conduct should first contact the instructor of the course. If the student remains unsatisfied, the student may contact the department head and/or dean of the college which offers the class to initiate a review of the evaluation.

ADA and Academic Dishonesty Policies:

Students are entitled to 'reasonable accommodations' under the provisions of the *Americans with Disabilities Act* (ADA). Information concerning the provisions of the ADA of 1990 and Section 504 of the Rehabilitation Act are available from the Office of Disability Services located in 145 Binnewies Hall. The telephone number is (605) 688-4504, (605) 688-4394 TTD.

Any form of academic dishonesty will not be tolerated. You are subject to the academic dishonesty policy in the following section.

Department of Wildlife and Fisheries Sciences
Academic Dishonesty Policy

The Department and the University have taken a strong and clear stand regarding academic dishonesty. We believe that it is unethical and unprofessional to present work done by others in a manner indicating that the student/s is/are presenting material as his/her original ideas or work; such activity is academic dishonesty. Plagiarizing or knowingly assisting others in plagiarizing on tests, quizzes, problems, assignments, research papers, theses, dissertations, or other academic activities is unacceptable behavior. All academic work completed by students is expected to be the original work of that individual student, unless permission is specifically granted beforehand by the faculty member for some form of team effort or other format. If students are unsure if a particular activity may be regarded as a form of academic dishonesty they should consult the faculty member before undertaking such an activity.

The University has a policy on academic honesty, procedures for academic grade and dishonesty appeals, and sanctions for such activities. The Student Code has **different** procedures for undergraduate and graduate students. http://www3.sdstate.edu/StudentLife/JudicialAffairs/StudentCode/Index.cfm

The Department policy described in this handout is intended to attempt to address perceived academic dishonesty violations between the faculty member/s and student/s **before** Student Code procedures are implemented. This is done because under Student Code procedures the **minimum** penalty for academic dishonesty is Disciplinary Probation. These added Department steps (Steps 1, 2, and 3 of the Undergraduate Student and Graduate Student Procedures) should not be construed as an attempt to circumvent the Student Code system; both students and/or the faculty member have the option to go directly into that system. The Department procedures portion of this policy is only available to a student one time; any second perceived offense will immediately follow the Student Code procedures.

Graduate Student Procedures

a. When a student/s is/are determined to have broken the Academic Dishonesty Policy, he/she will be notified **verbally** by the faculty member involved as to the problem and sanction selected. This is similar to procedures 02:02:01:03 and 02:02:01:04 in the Student Code. The faculty member will do this immediately after the perceived violation occurs. Sanction options available to the faculty member are as follows:

(1) provide the student/s a grade of zero or some other score on the test, quiz, problem, assignment, or other academic endeavor involved;

(2) provide the student/s a grade of "F" in the course;

(3) request that the student/s withdraw from the course;

(4) request that the student/s change the grading for the course to an "audit;" or

(5) immediately refer the case to the Student Code procedures.

The sanction selected is at the discretion of the faculty member, based on the seriousness of the situation. The student's advisor and/or Advisory Committee **may** be involved (see Student Code 02:05:01:02, 02:05:01:03, and 02:05:01:04).[1]

[1]The student's advisor and/or Advisory Committee **may** be included because items other than class work could be involved.

b. If the student/s agrees to the sanction proposed by the faculty member the process is completed. The student's advisor and /or Advisory Committee **may** be involved (see Student Code 02:05:01:02, 02:05:01:03, and 02:05:01:04).

c. If the student/s does not agree to the sanction proposed by the faculty member, he/she has the right to appeal the faculty member's decision. This **Informal Phase Appeal** should be made directly **(both verbally and in writing)** to the faculty member involved within five class days of notification or within seven calendar days of notification, if the incident is at the end of the semester.

The faculty member may then modify or leave unchanged the sanction proposed in step 1. A copy of the student's **written appeal** and the faculty member's **written response** will be sent to the Department Head so that a confidential record to protect the student/s and the faculty member is established. The student's written appeal and faculty member written response will be secured in the student's file until graduation or he/she leaves the program; if no further perceived violations have occurred these materials will be purged from the student's file. The student's advisor and/or Advisory Committee **may** be involved (see Student Code 02:05:01:02, 02:05:01:03, and 02:05:01:04).

d. If the student/s is/are still dissatisfied with the decision he/she can **verbally** appeal to the Graduate Dean. (These are steps 02:05:01:05, 02:05:01:06, and 02:05:01:07 in the **Informal Phase Appeal** process described in the Student Code.)

e. If all agree on the proposed sanction at this point, the process is completed. Up to this point, no one other than the student/s, faculty member, Graduate Dean, and possibly the student's advisor and Advisory Committee has been made aware of the situation.

f. If the student/s, faculty member, advisor, or Advisory Committee are dissatisfied with the Graduate Dean's decision they can enter the **Formal Phase** (Student Code 02:05:02) of the Student Code process. It is the responsibility of the student/s, faculty member, and student's advisor and Advisory Committee to be aware of the procedures and penalties involved.