FISH 631: Data Analysis in Community Ecology
Course Syllabus

1. Course information:
Title: Data Analysis in Community Ecology
Number: Fisheries (FISH) 631
Credits: 3
Prerequisites: STAT 200, STAT 401, MSL 494, or equivalent, FISH 693 (Stat. Comp. with R) or familiarity with R, general ecology, graduate standing in fisheries or permission of instructor.
Locations: Juneau: TBD; Fairbanks: TBD
Meeting times: TBD

2. Instructor:
Franz Mueter, office: Lena Point 315, Office Hours: Tue & Thu 1-5pm or by appointment
Phone: 907-796-5448
E-mail: fmueter@alaska.edu

3. Course readings:
Course textbook: Jongman, R.H.G., Ter Braak, C.J.F., and Van Tongeren, O.F.R. 1995. *Data analysis in community and landscape ecology*. Cambridge University Press, Cambridge.
Supplementary Readings: Hand-outs or pdf files will be provided

4. Course description:
This graduate level course covers univariate and multivariate statistical methods that are commonly used in the analysis of species abundance or presence/absence data, with an emphasis on marine science and fisheries applications. Topics include data collection & management, resource selection functions, dissimilarity measures, ANOSIM, multivariate normal distribution and multivariate outliers, ordination (*Principal Components Analysis, Multi-dimensional Scaling, Correspondence Analysis, Detrended Correspondence Analysis, Canonical Correspondence Analysis*), and cluster analysis. The emphasis throughout the course is on relating the presence, abundance, or other attributes of one (univariate) or many species (multivariate) to underlying environmental gradients, or to compare attributes among levels of a factor. Methods for drawing valid statistical inferences are illustrated with case studies and through hands-on labs, including the use of generalized linear models for modeling univariate data (logistic regression, Gaussian regression, Poisson regression), and distance-based randomization approaches for analyzing multivariate data.

5. Course goals:
General:

- Provide students with a general understanding of the quantitative methods that have been developed specifically to address problems in community ecology and to detect and test for spatial patterns, temporal trends, and multi-species interactions in environmental and ecological data sets.
- Provide students with the tools and the skills required to implement these methods.
- Prepare students for a career requiring the exploration and analysis of ecological datasets.

Student learning outcomes:

- Familiarity with multivariate statistical methods and software packages to implement them
- Ability to independently conduct exploratory analyses of multivariate environmental and biological datasets and to test specific hypotheses about patterns, trends, and relationships.
- Ability to communicate results from multivariate analyses to the public and to decision makers.

6. Instructional methods:
Lecture format with question and answer periods and occasional group discussions; short hands-on sessions will introduce methods discussed in class; weekly homework assignments will re-enforce concepts learned in class. Students will be required to complete an individual project in which they describe and analyze a multivariate dataset of their choice.

7. Course calendar:

Date	***Topic***
1	1. Introduction: Course goals and overview
2	2. Single species analyses (Autecology): a. Measures of prevalence and abundance b. Data collection, data management and data organization
3	c. Exploratory analyses: i. Graphical exploration ii. Frequency distributions
4	c. Exploratory analyses: iii. Standardizations and transformations iv. Outliers
5	d. Direct gradient analysis: Regression analyses to explore relationships between species and their environment i. Response curves, resource selection functions
6	ii. Quantitative abundance data (Least-squares regression and Poisson regression)
7	iii. Presence / absence data (logit regression)
8	3. Multi-species analyses (Synecology or community ecology) a. Overview
9	c. Univariate summaries of multi-species data: species richness, species diversity, evenness
10	d. Multivariate analyses i. Matrix algebra for ecology
11	Review & questions
12	Mid-term examination
13	Spring Break
14	Spring Break
15	3.d. Multivariate analyses i. Graphical summaries: Species distributions, ABC curves
16	ii. multivariate distributions, multivariate distance, identifying multivariate outliers
17	iii. Dissimilarity measures iv. Analysis of similarity (ANOSIM)
18	v. Finding patterns in species abundance data through indirect gradient analysis (Ordination): 1. Overview 2. Multi-dimensional scaling
19	Independent PRIMER lab
20	3. Interpretation of ordination with external data: graphical, BIO-ENV
21	4.a. Weighted averaging and reciprocal averaging
22	4.b Correspondence Analysis, Detrended Correspondence Analysis
23	5. Biplot of species and site scores
24	6. Canonical ordination a. Canonical correspondence analysis
25	b. Canonical correlation analysis, redundancy analysis

26	3.d.vi. Identifying species and station groups in species abundance data 1. Overview
27	2. Cluster analysis
28	Review & questions
29	Final Examination

8. Course policies:

a. Attendance is mandatory unless excused beforehand
b. Tardiness is unacceptable and will impact evaluations
c. Class participation is encouraged and will be part of your grade. You are encouraged to ask questions and comment as you feel appropriate in class.
d. Small-group discussions and collaboration on homework assignments and projects are encouraged
e. I will try to schedule exams to avoid conflicts. However, there are some unavoidable circumstances that may take precedence (such as field work). If you inform me in a timely manner, I will arrange for a makeup exam.
f. Plagiarism is unacceptable and will result in a failing grade for the assignment

9. Evaluation: See Table below.

Item	**Date**	**Percent of Grade**
1. Homework assignments	Throughout semester	40
2. Mid-term examination	See course outline	10
3. Individual project	Last day of classes	20
4. Final examination	See course outline	20
5. Class participation	Throughout semester	10
TOTAL		100

Each homework assignment, as well as the in-class mid-term and class participation, will be worth 10 points and will be graded in increments of 0.5 points. An individual student project and the final exam will be worth 20 points each. I will assign letter grades, which will be determined based on the total number of points obtained as follows:

Points	Grade
90 - 100 points	A (≤92.5: A-, ≥ 97: A+)
80 – 89.5 points	B (≤ 82.5: B-, ≥ 87: B+)
70 – 79.5 points	C (≤ 72.5: C-, ≥ 77: C+)
60 – 69.5 points	D (≤ 62.5: D-, ≥ 67: D+)
< 60 points	F

10. Support Services: Please see instructor if you have any special needs.
Additional help, non-subject oriented, can be obtained through the SFOS Academic Coordinator's office:

Christina Neumann
Phone: 907- 474-5840
email: neumann@sfos.uaf.edu

11. Disabilities Services: The instructor will work with the Office of Disabilities Services to provide reasonable accommodation to students with disabilities to ensure equal access to campus and to course materials in accordance with UAF policy and the ADA.