

Syllabus – Advanced Biostatistics, ZOOL 558, Spring 2005

Instructor: John D. Reeve, Dept. of Zoology, LS II Room 355F, 453-6670, jreeve@zoology.siu.edu. Office hours TBA.

Time: Lectures will be MW 4-5:15 in Room 367 of LSII, plus a discussion section to be arranged. The discussion will be used for sample problems, Q & A, demos of statistical software, and discussion of assigned readings from the ecological literature.

Text: (1) Sokal, R. R. and F. J. Rohlf. 1995. *Biometry: the Principles and Practice of Statistics in Biological Research*. W. H. Freeman and Co., New York, NY. (2) Rohlf, F. J. and R. R. Sokal. 1995. *Statistical Tables*. W. H. Freeman and Co., New York, NY. Copies of the lecture notes will also be provided at the beginning of each class. In addition, various readings from the ecological literature will be assigned for discussion. These will be made available in the Zoology Department grad student mail room.

Software:

(1) SAS for Windows, Version 9.1. SAS is the most commonly used statistical software in education, government, and industry. It is available at SIU through a site license and can be leased for either departmental or personal use for \$65. The lease period is one year, after which the software will cease running unless the lease is renewed. Many of you will have access to SAS through your graduate advisors. If you are interested in leasing SAS yourself, please complete the attached lease form and return it to Pamela Reed, Wham Educational Building 0B15. She will then provide you with the installation disks. While the software contains a help system, much of the SAS documentation is found in the SAS OnlineDoc system (<http://sasdocs.siu.edu/>). This system can only be accessed through the SIU network – you must use a computer on campus OR have a dial-up connection through SIU.

(2) PopTools. This is a free software add-in for Microsoft Excel (the Windows version only) and can be downloaded at <http://www.cse.csiro.au/poptools/>. It is useful for statistical procedures involving resampling (such as bootstrapping) and also provides some tools for population ecology.

Assignments and Grading: The overall grade will be based on 300 total points, divided among four problem sets (30 points each, 120 total), a midterm (50 points) and final (80 points), plus an oral presentation on a statistical problem in your own research (50 points). The midterm and a portion of the final are given in class. Grades are determined on a percentage basis (90-100% A, 80-90% B, 70-80% C, etc.). The material in the discussion readings may be included in the exams. Students are allowed to discuss the problem sets, and ask me questions about them, but each student must submit their own work (no copying).

Topics to be Covered

Model I and II Regression

S & R chapters: 14

SAS Online Doc: SAS/STAT – SAS/STAT User's Guide – Introduction to Regression Procedures, The GLM Procedure

Discussion: Sample problems, Q & A

Correlation and Principal Components

S & R chapters: 15

SAS Online Doc: Base SAS – Base SAS Procedures Guide: Statistical Procedures – The CORR Procedure, SAS/STAT – SAS/STAT User's Guide – The PRINCOMP Procedure

Discussion: Sample problems, Q & A

Assign Problem Set 1

Multiple Regression

S & R Chapters: 16

SAS Online Doc: SAS/STAT – SAS/STAT User's Guide – The REG Procedure

Discussion: Anderson et al. 2000, Guthery et al. 2001.

Analysis of Frequencies and Logistic Regression

S & R Chapters: 17

SAS Online Doc: SAS/STAT – SAS/STAT User's Guide – The FREQ Procedure, The LOGISTIC Procedure

Discussion: Sample problems, Q & A

Assign Problem Set 2.

Miscellaneous Methods - Jackknife and Bootstrap, Randomization Tests

S & R Chapters: 18

SAS Online Doc: None

Discussion: Dixon 2001

Midterm

Mantel Tests

S & R Chapters: 18

SAS Online Doc: None

Discussion: Fortin and Gurevitch 2001

Assign Problem Set 3.

BACI Designs – Environmental Impact Assessment

S & R Chapters: None

SAS Online Doc: SAS/STAT – SAS/STAT User's Guide – The GLM Procedure

Discussion: Stewart-Oaten *et al.* 1986

MANOVA

S & R Chapters: None

SAS Online Doc: SAS/STAT – SAS/STAT User’s Guide – The GLM Procedure

Discussion: Scheiner 2001

Assign Problem Set 4.

Repeated Measures Analysis

S & R Chapters: None

SAS Online Doc: SAS/STAT – SAS/STAT User’s Guide – The GLM Procedure, The Mixed Procedure

Discussion: von Ende 2001

Nonlinear Regression and Probit Analysis (Maybe)

S & R Chapters: None

SAS Online Doc: SAS/STAT – SAS/STAT User’s Guide – The NLIN Procedure, The PROBIT Procedure

Discussion: Sample problems, Q & A.

Student Presentations

Final

Bibliography

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

Dixon, P. M. 2001. The bootstrap and the jackknife: describing the precision of ecological indices. Pages 267-288 in *Design and Analysis of Ecological Experiments*, S. M. Scheiner and J. Gurevitch eds. Oxford University Press, New York, NY.

Fortin, M. and Gurevitch, J. 2001. Mantel tests: spatial structure in field experiments. Pages 308-326 in *Design and Analysis of Ecological Experiments*, S. M. Scheiner and J. Gurevitch eds. Chapman & Hall, New York, NY.

Guthery, F. S., Lusk, J. J., and Peterson, M. J. 2001. The fall of the null hypothesis: liabilities and opportunities. *Journal of Wildlife Management* 65: 379-384.

Scheiner, S. M. 2001. MANOVA: multiple response variables and multispecies interactions. Pages 99-115 in *Design and Analysis of Ecological Experiments*, S. M. Scheiner and J. Gurevitch eds. Chapman & Hall, New York, NY.

Stewart-Oaten, A., Murdoch, W. W. and Parker, K. R. 1986. Environmental impact assessment: “pseudoreplication” in time? *Ecology* 67: 929-940.

Von Ende, C. N. 2001. Repeated-measures analysis: growth and other time-dependent measures. Pages 134-157 in *Design and Analysis of Ecological Experiments*, S. M. Scheiner and J. Gurevitch eds. Chapman & Hall, New York, NY.