Model Based Statistics in Biology.
Part IV. The General Linear Model. Multiple Explanatory Variables
Chapter 12 Multiple Regression - Introduction

ReCap. Part I (Chapters 1,2,3,4)
ReCap Part II (Ch 5, 6, 7)
ReCap Part III (Ch 9, 10, 11)
12 Multiple Regression. Introduction
12.1 Two Explanatory Variables
12.2 Three Explanatory Variables
13 GLM multiway ANOVA
14 GLM ANCOVA
15 Review - GLM with multiple explanatory variables.

on chalk board

ReCap Part I (Chapters 1,2,3,4) Quantitative reasoning: Example of scallops, which combined models (what is the relation of scallop density to substrate?) with statistics (how certain can we be?)
ReCap Part II (Chapters 5,6,7)
Hypothesis testing uses the logic of the null hypothesis to make a decision about an unknown population parameter.
Estimation is concerned with the specific value of an unknown population parameter.
ReCap Part III (Ch 9, 10,11) The General Linear Model with a single explanatory variable.
The General Linear Model.
Advantage of learning unifying concepts rather than list of statistical tests.
GLM a general procedure that is more useful and flexible than a collection of special cases.

Today: Introduction to GLM, Multiple Explanatory Variable.
Distinction among Multiple regression, Multiway ANOVA, ANCOVA

Introduction

So far we have looked at one response variable Y as a function of one explanatory variable X

GLM Y = f(X)

Regression: X is on a ratio scale

relation of Y to X expressed by a line

One-way ANOVA: X is on an nominal scale (categories)

relation of Y to X expressed as a set of means, one for each category

Now we move to multiple explanatory variables. GLM Y = f(X1, X2, etc)

The explanatory variables can be regression variables . . . . . Multiple Regression

They can be categorical variables . . . . . Multiway ANOVA

They can be a mixture of

regression and categorical variables . . . . . Analysis of Covariance (ANCOVA)

Multiple explanatory variables have several uses in statistical analysis.

-Analyze the effects of one variables, controlling for another (statistical control)

-Efficient experimental design. Multifactor experiments yield more information per unit than single factor experiments. This is important when the costs of experimental units are high. In agriculture, the spatial unit may be small (plot) but requires considerable preparation and time to obtain results. In laboratory studies, we wish to minimize the number of experimental animals for ethical as well as economic reasons.

-Combine like studies to yield new insights.