#### **Seton Hall University**

From the SelectedWorks of Manfred Minimair

April, 2012

#### Statistical Research for the Kearny Marsh

Manfred Minimair, Seton Hall University Juliana Newman, Seton Hall University



Available at: http://works.bepress.com/minimair/3/

# STATISTICAL RESEARCH FOR THE KEARNY MARSH

Juliana Newman and Dr. Manfred Minimair Seton Hall University

# Introduction: Kearny Marsh









# Data Received-Organization

#### □ <u>Poster</u>

Treatments Done on Marsh to Contain Pollutants

Excel Spreadsheets

□ <u>Microsoft Access -- relationships</u>

## Limitations of Data

- □ Missing Values
- Not enough values
- Stopped counting chironomids at 500

RESULT -- > we confined our data to 3 species, chironomid, mayfly, scud

# Our Questions

1. How does abundance vary by time?

2. How does abundance vary by time and treatment?

3. How does abundance depend on environmental features?

# 1. How does abundance vary by time?

<u>Comparing Species Means: Dependent</u> <u>t-test and Wilcoxon signed-rank Test</u>

- The group means of chironomid, scud, and mayfly were compared per year, per pair of seasons that follow each other, and per pair of the same season in different years.
- If the pair being compared was normally distributed, the *t*-test was used. If the pair being compared was not normally distributed, the Wilcoxon signed-rank Test was used.

# **Chironomid: Comparing Years**

- We did not compare the data from 2005 to the data from 2006 because data from 2005 was only collected in the Fall.
- On average according to the Wilcoxon test, the mean abundance of chironomids significantly decreased from 2006 (M=189.79, SE=19.72) to 2007 (M=142.44, SE=18.86), t(69)=2.06, p<.05, r=0.24.</p>







# Scud: Comparing Years

- We did not compare the data from 2005 to the data from 2006 because data from 2005 was only collected in the Fall.
- The mean abundance of scuds was significantly higher in 2006 (Mdn=19) than in 2007 (Mdn=10), T=27, z=-2.495, p<.05, r= -.305, according to the Wilcoxon test.







# Mayfly: Comparing Years

- We did not compare the data from 2005 to the data from 2006 because data from 2005 was only collected in the Fall.
- According to the Wilcoxon test, the mean abundance of mayflies was significantly higher in 2006 (Mdn=0) than in 2007 (Mdn=0), T=5, z=-2.509, p<0.5, r=-.307.</p>







# Result: 1. How does abundance vary by time?

- Most significant changes were decreases as time went on.
- Surprising findings

# How does abundance vary by time and treatment?

2.

## Mixed Models Analysis

- ANOVA missing values in data
- Used Mixed Models analysis to estimate the size of the effect of treatment and year by fitting a linear model to the data



# Mixed Models: Spring 2006-2007

Sig < 0.05 we can reject assumption that mean is zero, thus there is an effect.

### Fixed Effects

#### Type III Tests of Fixed Effects<sup>a</sup>

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	24.293	102.584	.000
TimelD	11 C	25.264	20.179	.000
TreatIgnoreSS	2	26.378	.190	.828

a. Dependent Variable: chironomid.

# Mixed Models: Summer 2006-2007

## Fixed Effects

#### Type III Tests of Fixed Effects<sup>a</sup>

Source	Numerator df	Denominator df	Ē	Sig.
Intercept	1	24.081	109.109	.000
TimelD	1	26.131	.107	.746
TreatignoreSS	2	22,525	16.848	.000

a. Dependent Variable: chironomid.

## Mixed Models: Fall 2006-2007



Source	Numerator df	Denominator df	F	Sig.
Intercept	1	25.846	37.017	.000
TimelD	1	26.740	.547	.466
TreatIgnoreSS	2	27.423	1.651	.210

Result:

2. How does abundance vary by time and treatment?

- The treatment had an effect in the Summer, but not in the Fall or the Spring.
- The time had an effect in the Spring, but not in the Summer or in the Fall.

# How does abundance depend on environmental features?

3.

## Environmental Factors vs. Abundance

- We looked for linear regression lines between environmental factors, and the number of chironomids, scuds, and mayflies.
- The environmental factors used were: Conductivity, Depth, DO, pH, Redox, Salinity, Temp, TSS, and Total w/o Fe (metals). We used SPSS to create scatter plots, and then drew regression lines.
- After observing all of the plots, we noticed that they were not significantly linearly related.

# Chironomid vs. DO $R^2 = 0.005$

## Chironomid vs. Redox R^2= 0.029



### Scud vs. Total without Fe

### Mayfly vs. Depth



There was no feasible regression line drawn.

#### We observed different clusters, and examined them through colored graphs.



# Temperature appears to be clustered by season for chironomid, scud, and mayfly.



#### Next we looked at salinity by season and year.



## Salinity appears to be clustered by season and year for chironomid, scud, and mayfly.



Result:

3. How does abundance depend on environment?

- The abundance varied greatly despite some clusters based on year or season.
- Abundance did not seem to depend on any environmental features that we studied.

# Conclusions

- As time went on, we saw more decreases in the abundance of different species
- The treatment had an effect in the Summer, but not in the Fall or the Spring.
- The time had an effect in the Spring, but not in the Summer or in the Fall.
- Abundance of species did not seem to depend on any environmental features that we studied.

## Open Questions for Future

• Do any environmental factors influence abundance?

- Does variation depend at all on geography of marsh?
- We have more data about pollution of water and sediment that can be analyzed.

# Thank You!

- Dr. Carolyn Bentivegna Data
- Dr. Manfred Minimair Advisor
- Clare Boothe Luce Scholarship Sponsor