A Final **R**Markdown Document in HTML Format

Student R. Me

10 September, 2019

## Homework #1

### The Question

A study was undertaken to explore the foraging behavior of adult ospreys during the breeding season. The first of several questions asked was whether prey choice (capture) was independent of osprey sex during the 3-month breeding season. Individual male and female ospreys were watched and the species of fish captured was recorded.

Objectives were to:

* Determine if prey selection was independent of osprey sex
* Build a plot of the data.
* Examine standardized residuals.

### The Analysis Using R

First import the data, then examine the data:

# import data from external .csv file  
 osprey <- read.csv("data/ospreypreybysex.csv", header = T)  
 osprey # examine raw data

## ospreysex fishspp count  
## 1 Male Sunfish 59  
## 2 Female Sunfish 72  
## 3 Male Bass 14  
## 4 Female Bass 21  
## 5 Male Shad 189  
## 6 Female Shad 138

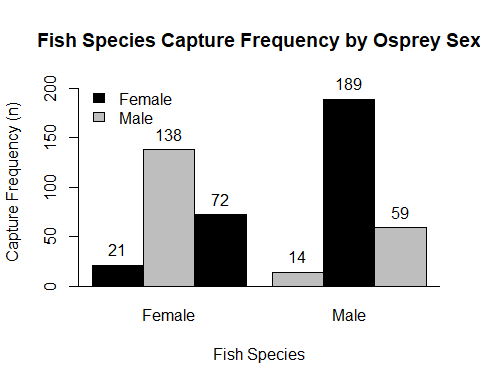
Next create a cross-tabulated table of frequencies by fish species and osprey sex.

# crosstabs to mimic data table  
 osprey.xtab <- xtabs(count ~ fishspp + ospreysex, data = osprey)  
 osprey.xtab # examine cross-tabulated data

## ospreysex  
## fishspp Female Male  
## Bass 21 14  
## Shad 138 189  
## Sunfish 72 59

Construct a barplot of the capture frequencies.

# embed a barplot  
 freq.r <- range(0, signif(max(osprey$count), 1) + 10) # use raw data for ylim= range  
 bplot1 <- barplot(osprey.xtab, ylim = freq.r, xlab = "Fish Species",   
 ylab = "Capture Frequency (n)", space = c(0, 0.5), col = c("black", "grey"), beside = T)  
 abline(h = 0) # add line to bottom of plot  
  
# add legend  
 legend("topleft", c("Female", "Male"), fill = c("black", "grey"), bty = "n", cex = 1)  
 title(main = "Fish Species Capture Frequency by Osprey Sex")  
 text(x = bplot1, y = c(osprey.xtab[1:6]), labels = c(osprey.xtab[1:6]), pos = 3) # adds osprey.xtab counts above



Implement the test, examine output, and see what objects are available after the analysis.

# Pearson chisq   
 osprey.chi2 <- chisq.test(osprey.xtab) # chisq test  
 osprey.chi2 # output from chisq test

##   
## Pearson's Chi-squared test  
##   
## data: osprey.xtab  
## X-squared = 8.7294, df = 2, p-value = 0.01272

ls(osprey.chi2) # available objects from chisq test

## [1] "data.name" "expected" "method" "observed" "p.value" "parameter"  
## [7] "residuals" "statistic" "stdres"

Last, examine some diagnostics for interpretation, especially the standardized residuals. The standardized residuals provide an indication where deviations for expected capture frequencies deviate.

# examine diet preferences by sex  
 chisq.test(osprey.xtab)$observed # observed captures

## ospreysex  
## fishspp Female Male  
## Bass 21 14  
## Shad 138 189  
## Sunfish 72 59

chisq.test(osprey.xtab)$expected # expected captures

## ospreysex  
## fishspp Female Male  
## Bass 16.39959 18.60041  
## Shad 153.21907 173.78093  
## Sunfish 61.38134 69.61866

100 \* osprey.xtab/apply(osprey.xtab, 1, sum) # percent captures

## ospreysex  
## fishspp Female Male  
## Bass 60.00000 40.00000  
## Shad 42.20183 57.79817  
## Sunfish 54.96183 45.03817

chisq.test(osprey.xtab)$stdres # standardized residuals

## ospreysex  
## fishspp Female Male  
## Bass 1.616751 -1.616751  
## Shad -2.906524 2.906524  
## Sunfish 2.169669 -2.169669

### Interpretation

Male and female ospreys differ in their diets ( = 8.729, *p* = 0.013, *df* = 2). Shad makes up more than half the diet of both male and female birds, but for the males it is over 72%, whereas for the females it is about 60%. Proportionally, bass and sunfish make up slightly smaller portions of the average male’s diet than in the female’s diet.

Overall, both males and females appear to be selecting bass at approximately their relative availability. Males preferentially capture shad at higher proportions than expected, while under-utilizing sunfish. Females preferentially capture sunfish and ignore shad.

### The RMD code used to build the HTML output is in the box below

---  
title: "A Final \*\*R\*\*Markdown Document in HTML Format"  
author: "Student R. Me"  
date: "10 September, 2019"  
output:   
 html\_document:  
 keep\_md: true  
 pdf\_document: default  
 word\_document: default  
---  
  
<!-- set root directory here -->   
<!-- your directory will be specific to you -->  
```{r global\_options, include=FALSE}  
knitr::opts\_knit$set(root.dir = "~/words/github/useRfiles/rmd-files")  
knitr::opts\_chunk$set(warning=FALSE)  
```  
  
---  
  
---  
  
## Homework \#1  
  
---  
  
### The Question  
  
A study was undertaken to explore the foraging behavior of adult ospreys during the breeding season. The first of several questions asked was whether prey choice (capture) was independent of osprey sex during the 3-month breeding season. Individual male and female ospreys were watched and the species of fish captured was recorded.   
  
Objectives were to:  
  
\* Determine if prey selection was independent of osprey sex  
\* Build a plot of the data.  
\* Examine standardized residuals.  
  
---  
  
### The Analysis Using R  
  
First import the data, then examine the data:  
  
```{r}  
# import data from external .csv file  
 osprey <- read.csv("data/ospreypreybysex.csv", header = T)  
 osprey # examine raw data  
```  
  
Next create a cross-tabulated table of frequencies by fish species and osprey sex.  
  
```{r}  
# crosstabs to mimic data table  
 osprey.xtab <- xtabs(count ~ fishspp + ospreysex, data = osprey)  
 osprey.xtab # examine cross-tabulated data  
```  
  
Construct a barplot of the capture frequencies.  
  
```{r}  
# embed a barplot  
 freq.r <- range(0, signif(max(osprey$count), 1) + 10) # use raw data for ylim= range  
 bplot1 <- barplot(osprey.xtab, ylim = freq.r, xlab = "Fish Species",   
 ylab = "Capture Frequency (n)", space = c(0, 0.5), col = c("black", "grey"), beside = T)  
 abline(h = 0) # add line to bottom of plot  
  
# add legend  
 legend("topleft", c("Female", "Male"), fill = c("black", "grey"), bty = "n", cex = 1)  
 title(main = "Fish Species Capture Frequency by Osprey Sex")  
 text(x = bplot1, y = c(osprey.xtab[1:6]), labels = c(osprey.xtab[1:6]), pos = 3) # adds osprey.xtab counts above  
```  
  
Implement the $\chi^2$ test, examine output, and see what objects are available after the analysis.  
  
```{r}  
# Pearson chisq   
 osprey.chi2 <- chisq.test(osprey.xtab) # chisq test  
 osprey.chi2 # output from chisq test  
 ls(osprey.chi2) # available objects from chisq test  
```  
  
Last, examine some diagnostics for interpretation, especially the standardized residuals. The standardized residuals provide an indication where deviations for expected capture frequencies deviate.  
  
```{r}  
# examine diet preferences by sex  
 chisq.test(osprey.xtab)$observed # observed captures  
 chisq.test(osprey.xtab)$expected # expected captures  
 100 \* osprey.xtab/apply(osprey.xtab, 1, sum) # percent captures  
 chisq.test(osprey.xtab)$stdres # standardized residuals  
```  
  
---  
  
### Interpretation  
  
Male and female ospreys differ in their diets ($\chi^2$ = `r round(osprey.chi2$statistic, 3)`, \*p\* = `r round(osprey.chi2$p.value, 3)`, \*df\* = `r osprey.chi2$parameter`). Shad makes up more than half the diet of both male and female birds, but for the males it is over 72%, whereas for the females it is about 60%. Proportionally, bass and sunfish make up slightly smaller portions of the average male's diet than in the female's diet.   
  
Overall, both males and females appear to be selecting bass at approximately their relative availability. Males preferentially capture shad at higher proportions than expected, while under-utilizing sunfish. Females preferentially capture sunfish and ignore shad.  
  
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